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NATIONAL LABORATORY

Occurrence Performance 6-Month Update FY 2003

Incident Investigation

Control Chart Review

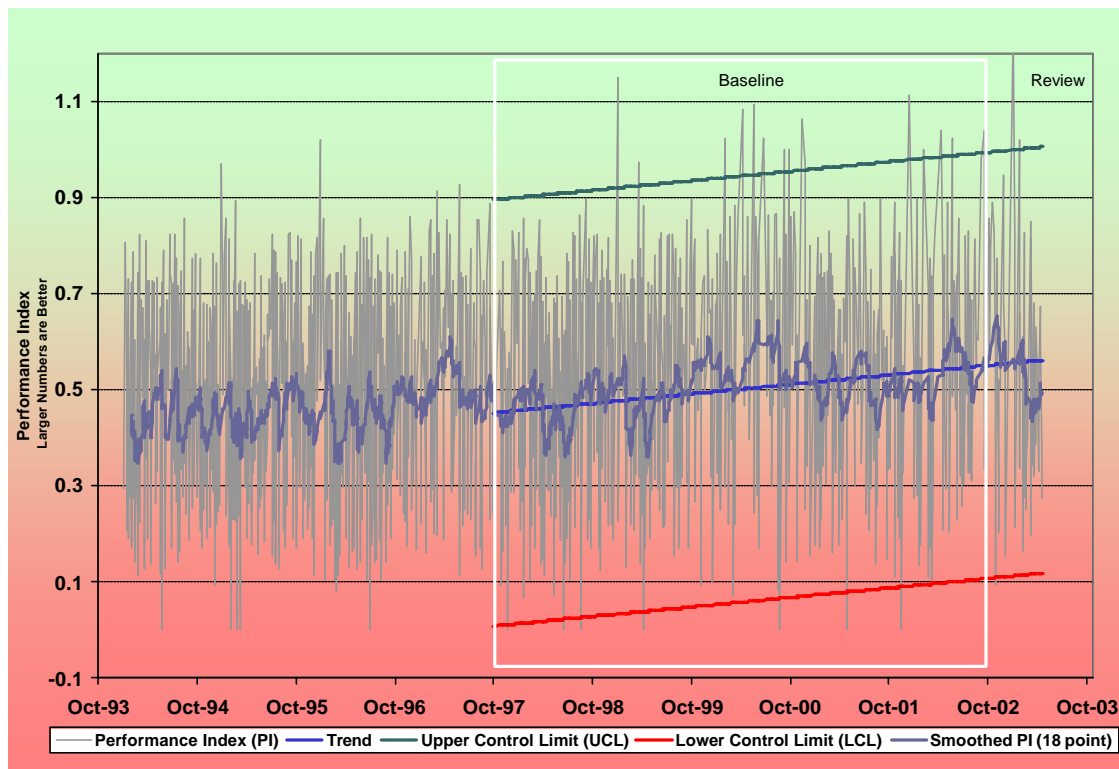**Scorecard Assignment**

Action Development

Fixing LANL's Problems!

LANL Overall Review

FY2003
(6 month)

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LANL Occurrence Performance
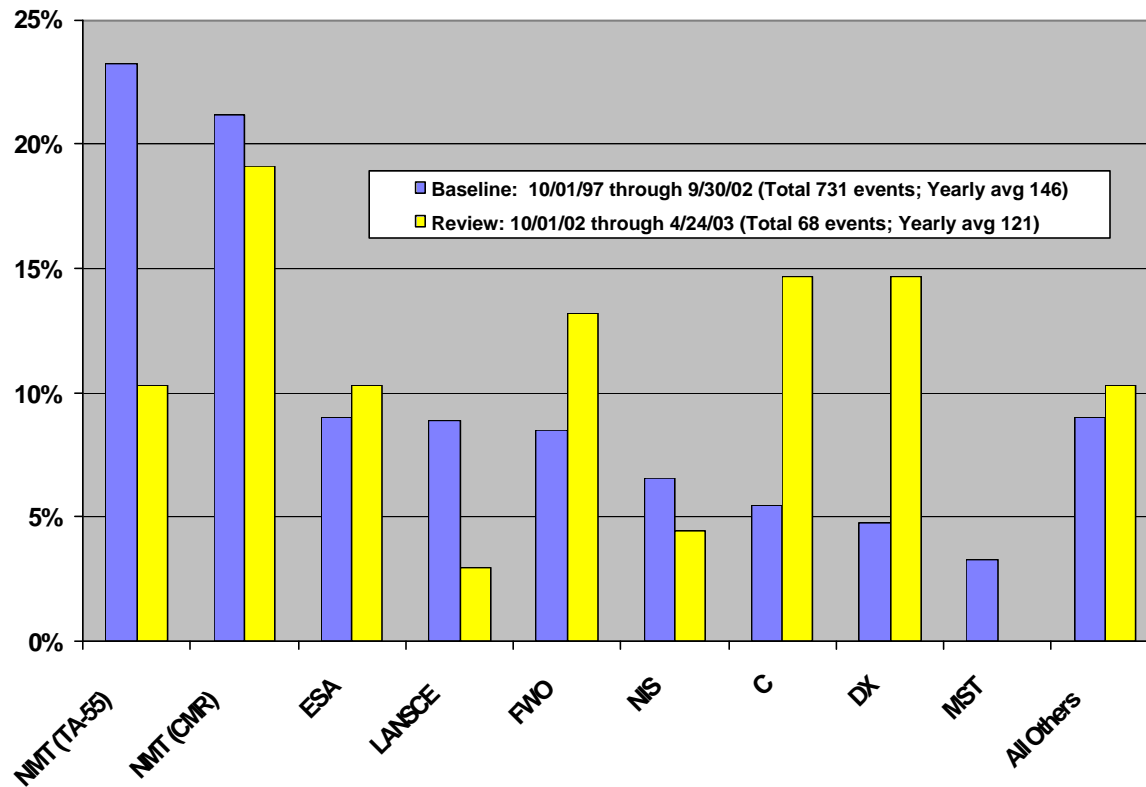

LANL PI Control Chart
01/01/94 to 4/24/03

- Total 1,584 events severity weighted 2, 3, or 4
  - Pre-Baseline: 785 events
  - Baseline: 731 events
  - Review: 68 events

Review Period Score	
🟩	**Sustained Performance**
🟨	**Review Period Trend**
🟥	**Over/Under Trend**
🟩	**Annualized Rate**
🟩	**Control Limit**
🟨	**OVERALL SCORE**

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Distribution of LANL Occurrences—Organizational

Baseline: 10/01/97 through 9/30/02 (Total 731 events; Yearly avg 146)

Review: 10/01/02 through 4/24/03 (Total 68 events; Yearly avg 121)

Occurrences by Facility Owner
Baseline vs. Review

- Average annual number of events has dropped from 146 in baseline to 121 in review

- 8 Divisions account for nearly 90% of occurrences in review period — NMT, FWO, ESA, C, LANSCE, NIS, DX, MST

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Distribution of LANL Occurrences— Safety Function

Occurrences by Type
Baseline vs. Review

Chart legend:
- Baseline: 10/1/97 through 9/30/02 (Total 731 events; Yearly Avg 146)
- Review: 10/01/02 to 4/24/03 (Total 68 events; Yearly Avg 121)

X-axis categories: Radiological Protection, Personnel Safety, Authorization Basis, Environmental, Safety SSC Problem, Property/Equipment Problem, Fire Protection, Packaging and Transportation, All Others
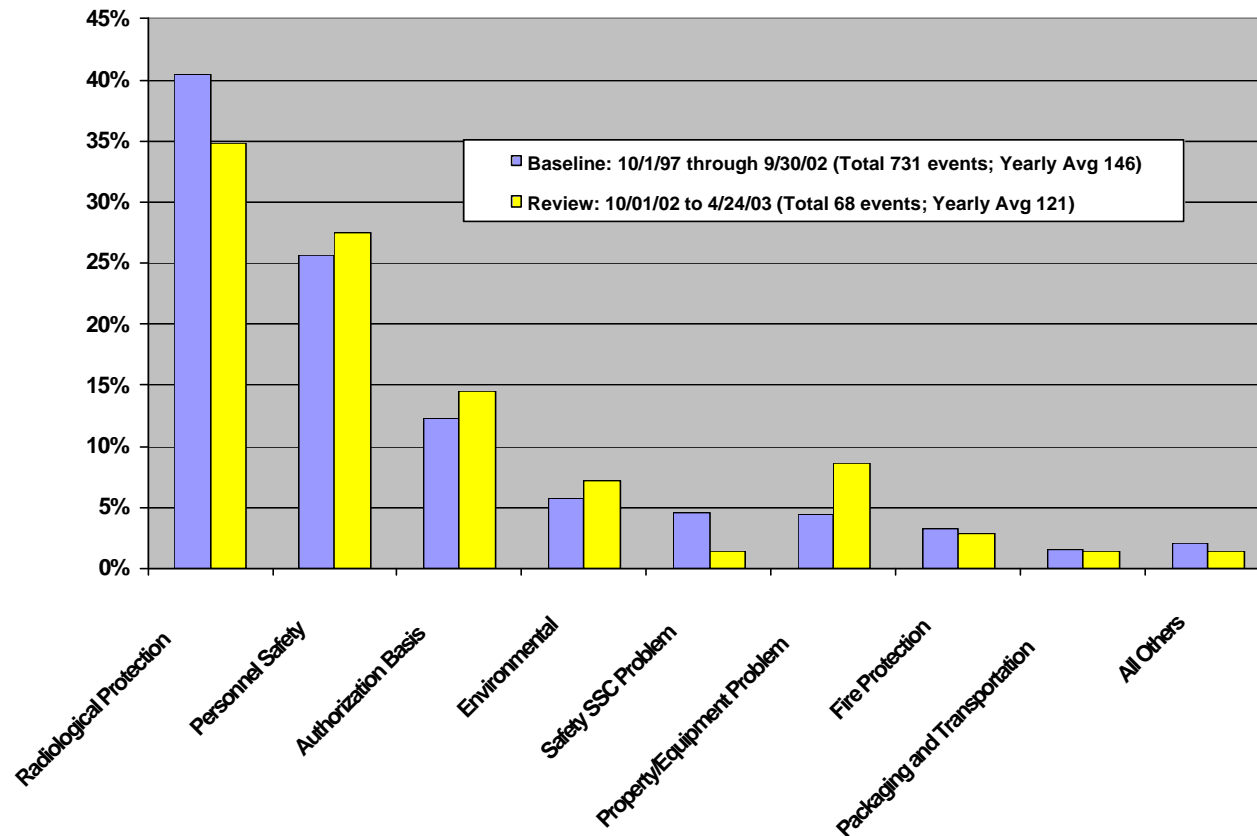
• Radiological Protection and Personnel Safety predominant types— 66% of total in baseline and review

• 4 other types account for 26% of LANL events — Authorization Basis, Environmental, Fire Protection, and Property/Equipment Problem

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LANL Scorecard of Occurrence Performance in Review Period

| LANL Occurrence PI Scorecard		Radiological Protection	Personnel Safety	Authorization Basis	Property or Equipment Problem	Environmental	Fire Protection
[yellow]		[yellow]	[yellow]	[red]	[yellow]	[red]	[green]
NMT (TA-55)	[green]	[green]	[green]	[green]	N/A	[green L]	[green L]
NMT (CMR)	[yellow]	[red]	[green]	[green]	[pink L]	[green L]	[green L]
FWO	[yellow]	[green]	[green]	[pink L]	[pink L]	[yellow]	[green L]
ESA	[yellow]	[green]	[green]	[red]	[green L]	[green]	[pink L]
C	[red]	[red]	[red]	[pink L]	[green L]	[green L]	[green L]
LANSCE	[green]	[green]	[green]	[green L]	[green L]	[green L]	[green L]
NIS	[green]	[green]	[yellow]	[yellow]	[green L]	[green L]	[green L]
DX	[red]	[green]	[red]	[yellow L]	[green L]	[yellow]	[pink L]
MST	[green]	[green L]	[green]	[green L]	[green L]	[green L]	[green L]
All Others	[yellow]	[green]	[green]	[pink L]	[red]	[green]	[green L]

LANL Scorecard

- 4 Organizations and 1 Safety Function show improving performance during review period
- 6 Organizations and 5 Safety Functions show static or declining performance during review period

LEGEND

|	
[green]	Improving performance
[green L]	Improving performance (limited data)
[yellow]	Static performance
[yellow L]	Static performance (limited data)
[red]	Declining performance
[pink L]	Declining performance (limited data)
[N/Δ]	No occurrences in baseline or review

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Direct Causes of LANL Occurrences
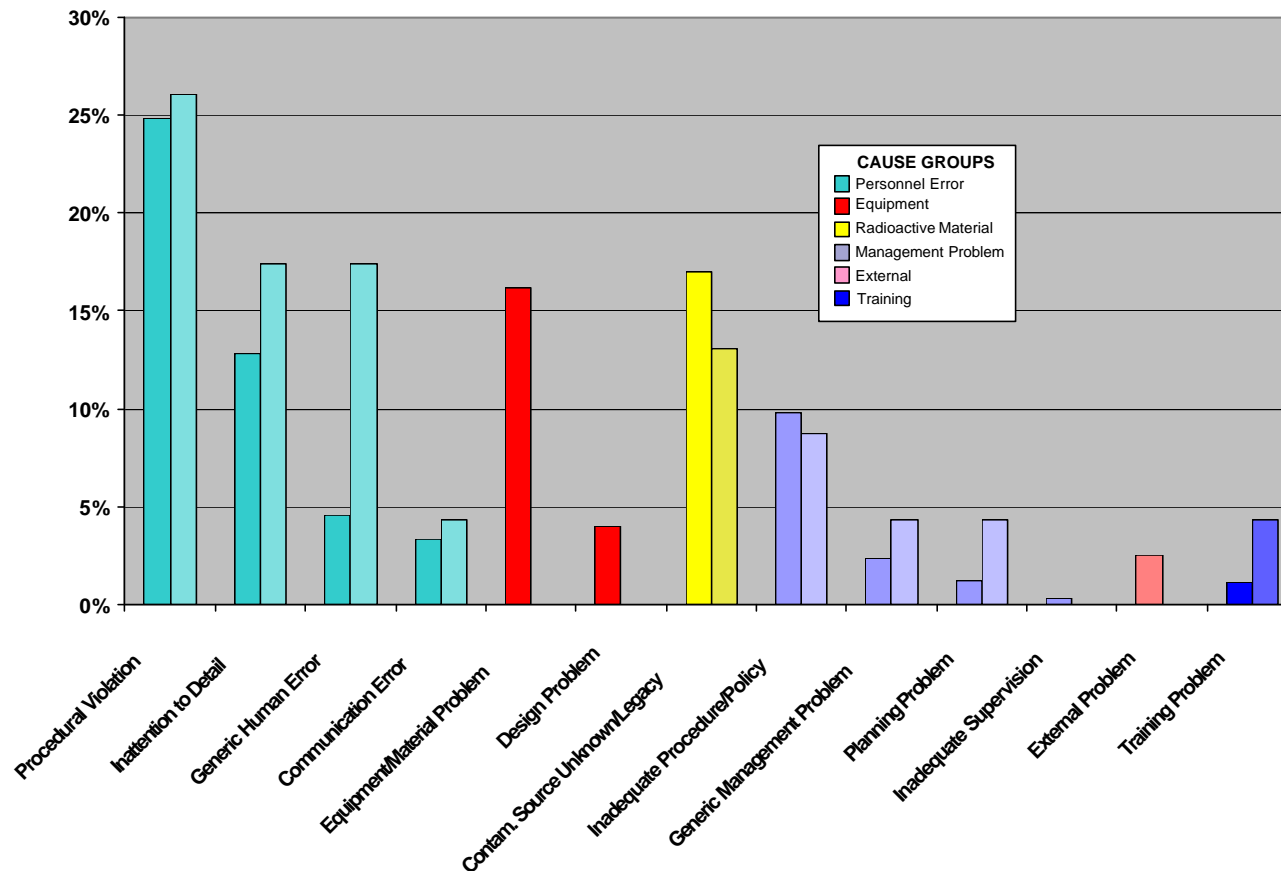
Direct Causes
Baseline vs. Review

• 46% of LANL events identify personnel error as direct cause in baseline and review periods
• 19% identify equipment problems (none in review period)
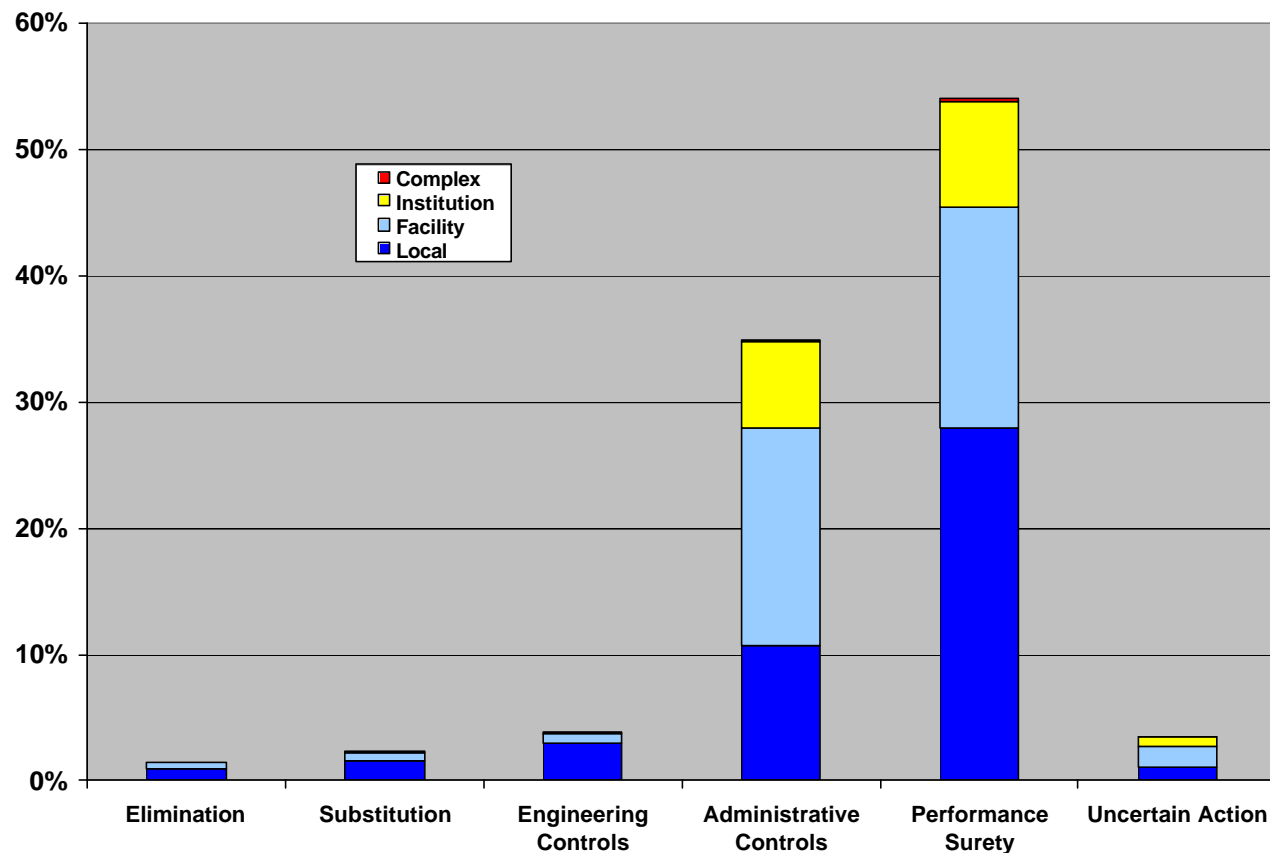• 17% specify legacy or unknown radiological source

Root Causes of LANL Occurrences
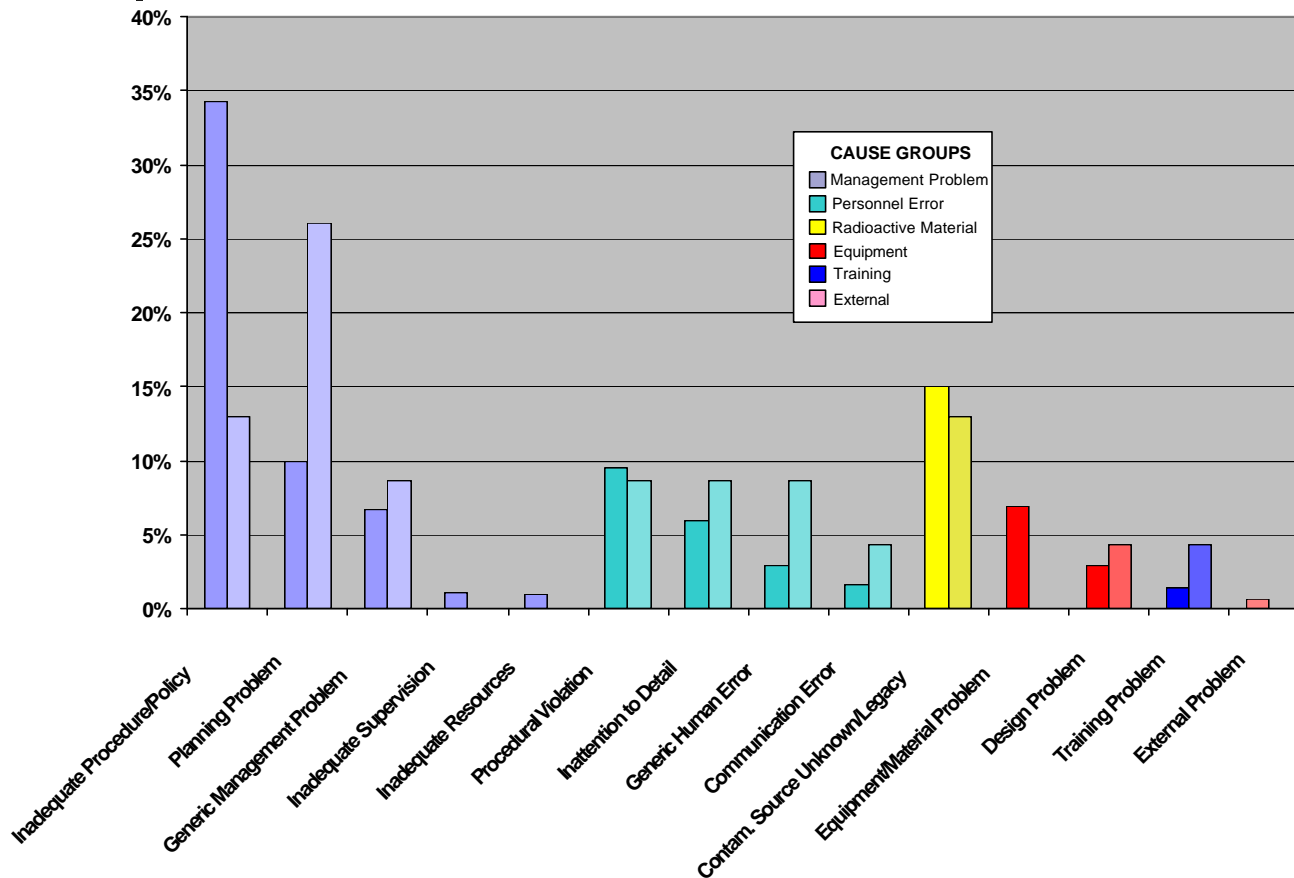
Root Causes
Baseline vs. Review

- 53% of LANL events identify management problem as root cause in baseline and review periods
- 20% identify personnel error
- 15% identify legacy contamination or unknown source
- 9% identify equipment problem

Profile of LANL Corrective Actions

Corrective Actions
(10/01/97 to 4/24/03)

• About 3% of actions target eliminating or substituting for lesser hazard
• Less than 5% specify new or modified engineering barriers
• Nearly 90% of all actions target procedural changes or "performance surety" actions
• Most actions at facility or local level—16% institutional

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LANL Performance Surety Actions
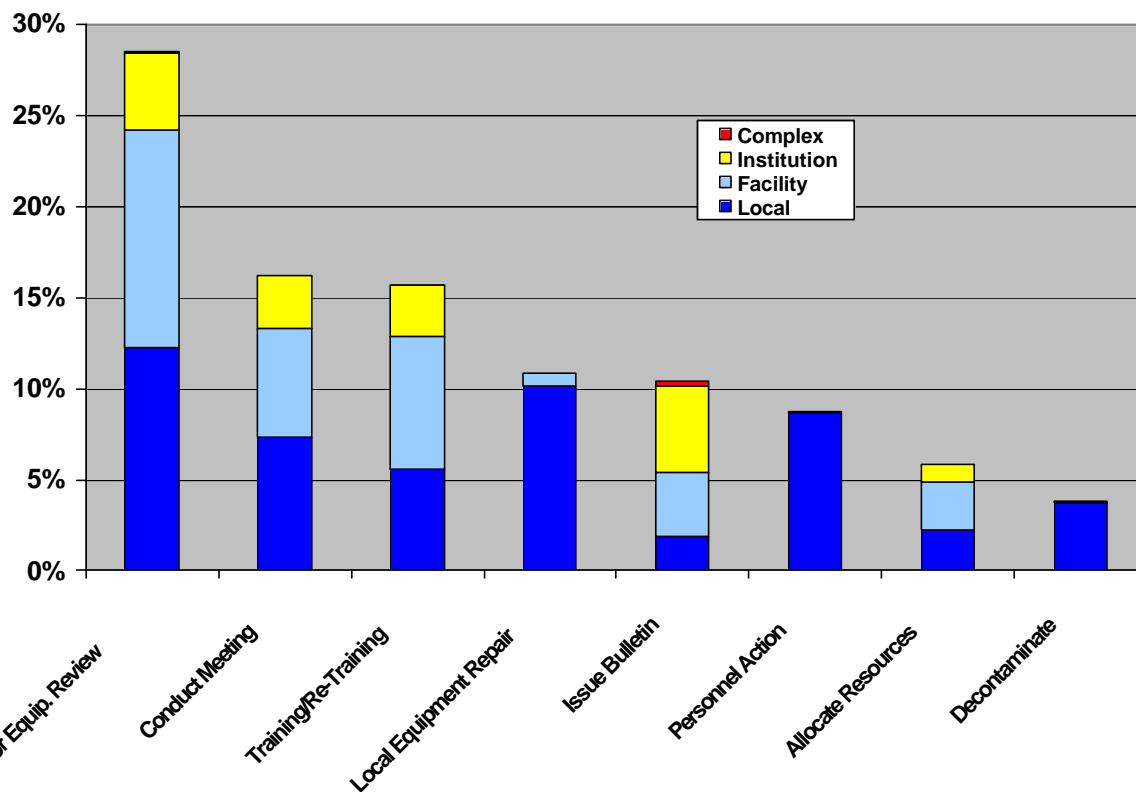
Performance Surety Actions
(10/01/97 to 4/24/03)

• More than 80% of performance surety actions involve reactive, one-time facility or local response—area, document or equipment reviews, meetings, single training, decon, etc.
• About 16% of performance surety actions targeted at institutional level
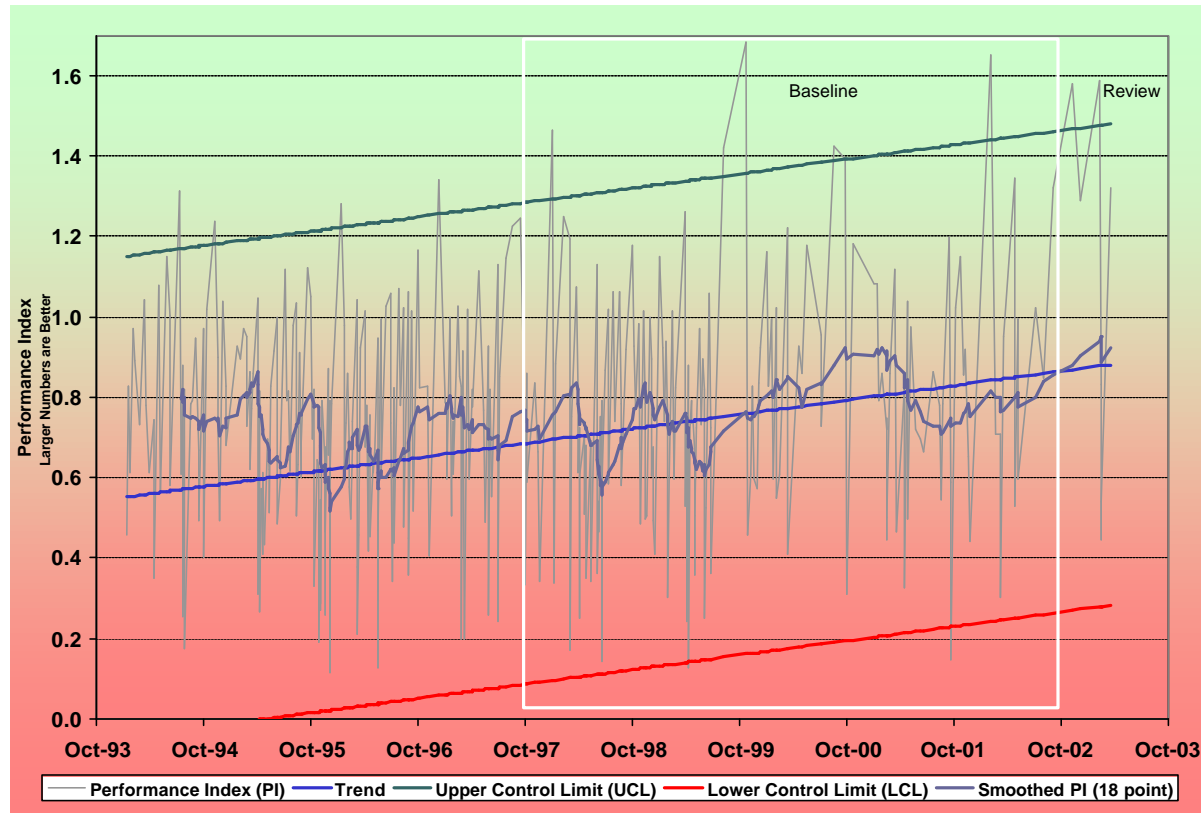
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LANL Organizational Review

FY2003
(6 month)

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NMT (TA-55) Division Occurrences

FY2003
(6 month)

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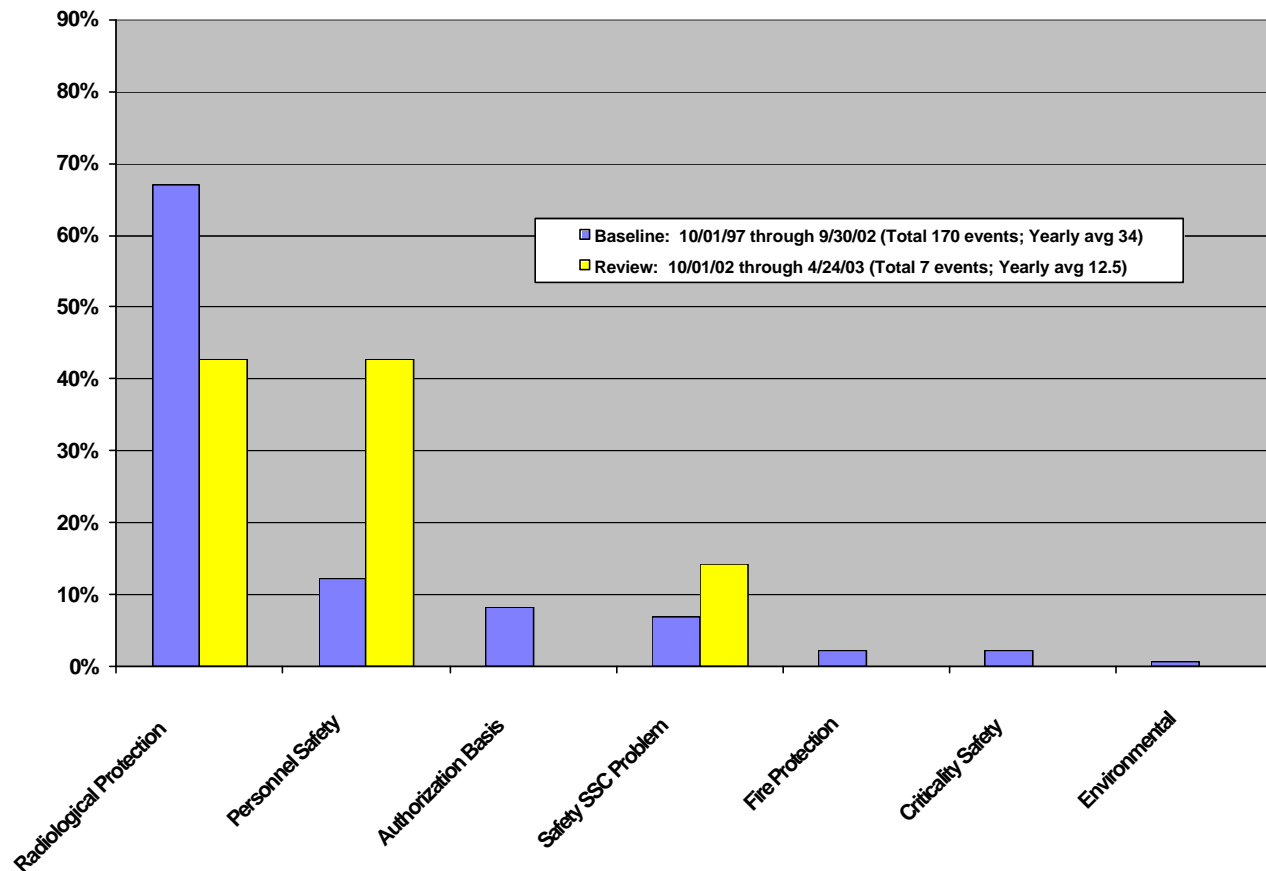# TA-55 Occurrence Performance

TA-55 PI Control Chart
(1/94 to 4/24/03)

- 365 events severity weighted 2, 3, or 4
  - Pre-Baseline: 188 events
  - Baseline: 170 events
  - Review: 7 events

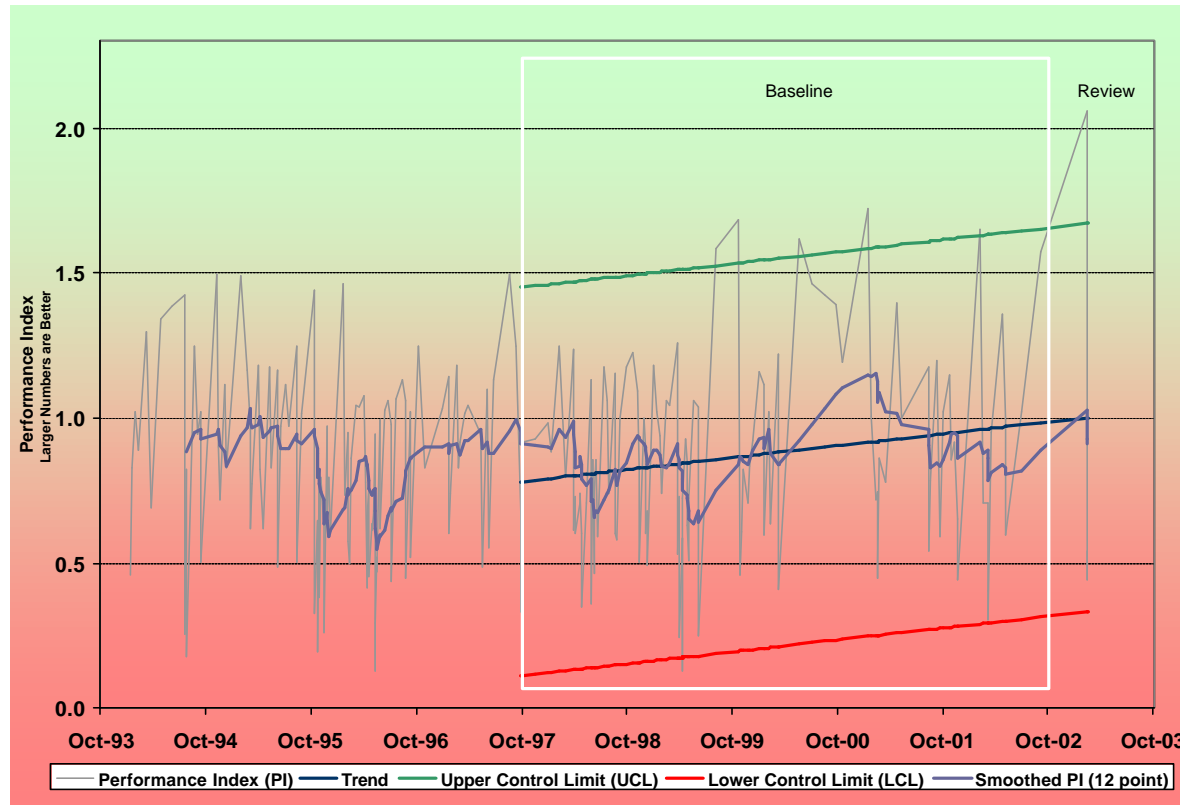| Review Period Score	
🟩	Sustained Performance
🟨	Review Period Trend
🟨	Over/Under Trend
🟩	Annualized Rate
🟩	Control Limit
🟩	OVERALL SCORE

Type Distribution of TA-55 Occurrences

Occurrences by Type
Baseline vs. Review

- Radiological Protection accounts for nearly 70% in baseline—declines to 43% in review period

- Personnel Safety increases from 12% in baseline to 43% in review period

- Safety SSC Problem increases from 7% in baseline to 14% in review period

Chart legend:
- ■ Baseline: 10/01/97 through 9/30/02 (Total 170 events; Yearly avg 34)
- ■ Review: 10/01/02 through 4/24/03 (Total 7 events; Yearly avg 12.5)

Categories (x-axis): Radiological Protection, Personnel Safety, Authorization Basis, Safety SSC Problem, Fire Protection, Criticality Safety, Environmental

Y-axis: 0% to 90%

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TA-55 Radiological Protection Occurrence Performance*

Radiological Protection Control Chart
(1/94 to 4/24/03)

223 events severity weighted 2 or 3

- Pre-Baseline: 106 events
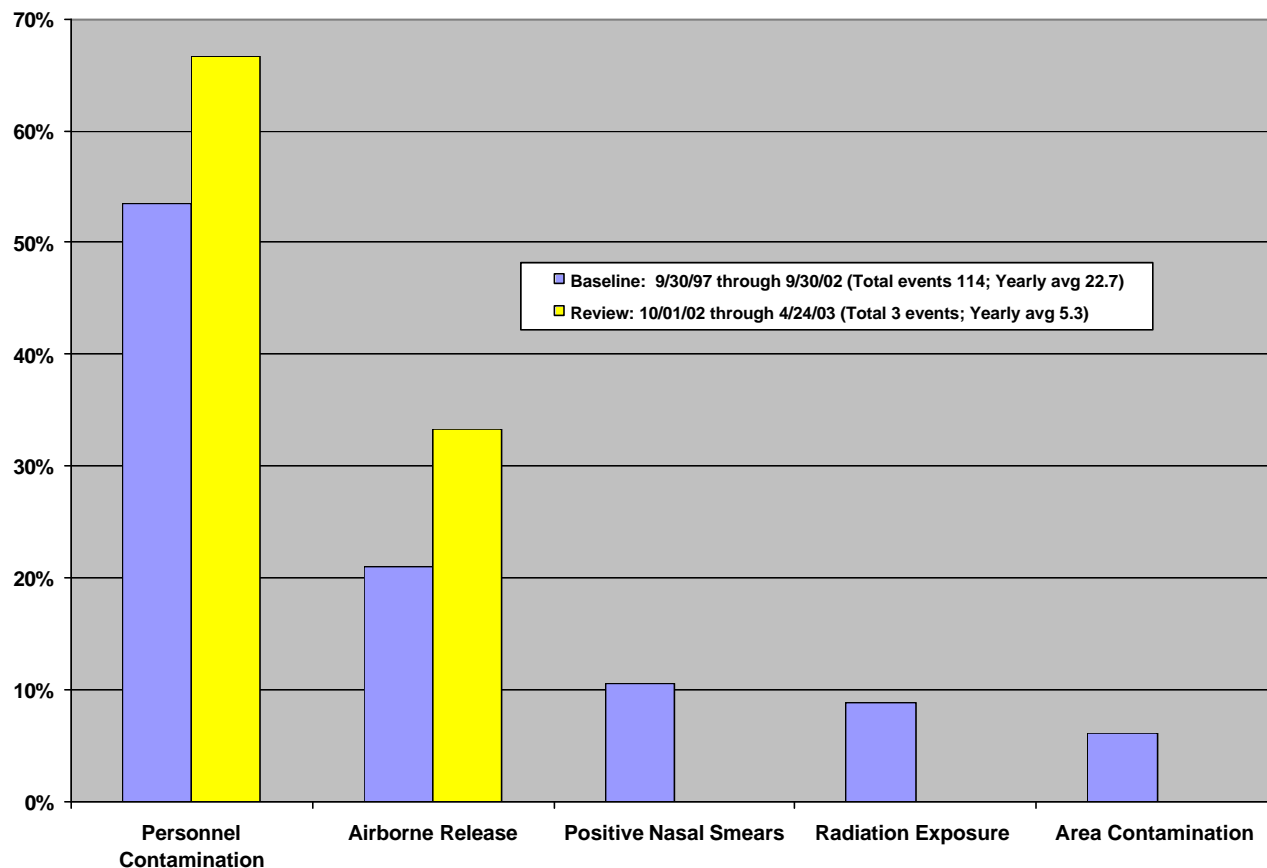- Baseline: 114 events
- Review: 3 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
🟩	**Control Limit**
🟩	**OVERALL SCORE**

* Does not include TA-55 airborne events since 4/24/03
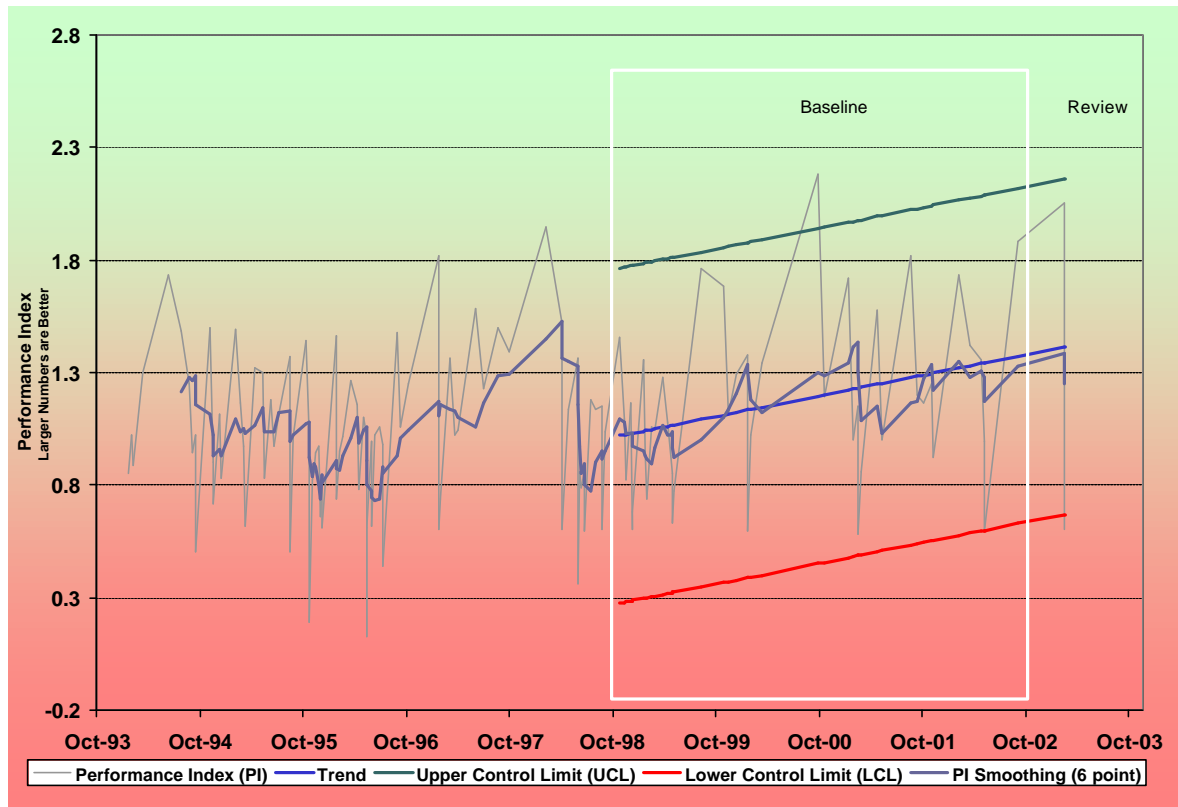**CLICK HERE FOR UPDATED CHART**

Types of TA-55 Radiological Protection Occurrences

TA-55 Radiological Occurrences by Type
Baseline vs. Review

- Personnel contamination events account for more than 50% in baseline and 65% in review (2 events)

- Airborne releases account for 21% in baseline and 33% in review (1 event)

Chart legend:
- Baseline: 9/30/97 through 9/30/02 (Total events 114; Yearly avg 22.7)
- Review: 10/01/02 through 4/24/03 (Total 3 events; Yearly avg 5.3)

Categories (x-axis): Personnel Contamination, Airborne Release, Positive Nasal Smears, Radiation Exposure, Area Contamination

Y-axis: 0% to 70%

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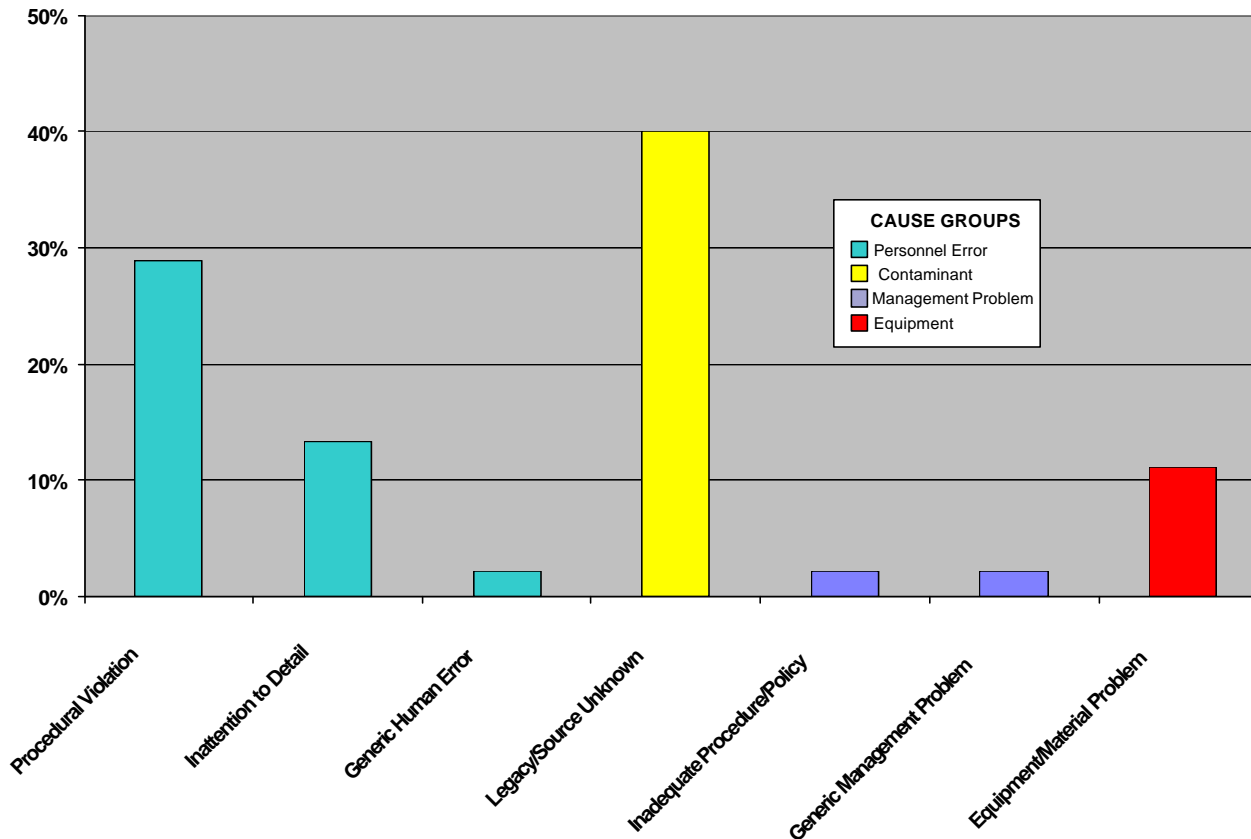# TA-55 Personnel Contamination Occurrence Performance

Personnel Contamination Control Chart
(1/94 to 4/24/03)

- 131 events severity weighted 2, 3, or 4
  - Pre-Baseline: 84 events
  - Baseline: 45 events
  - Review: 2 events

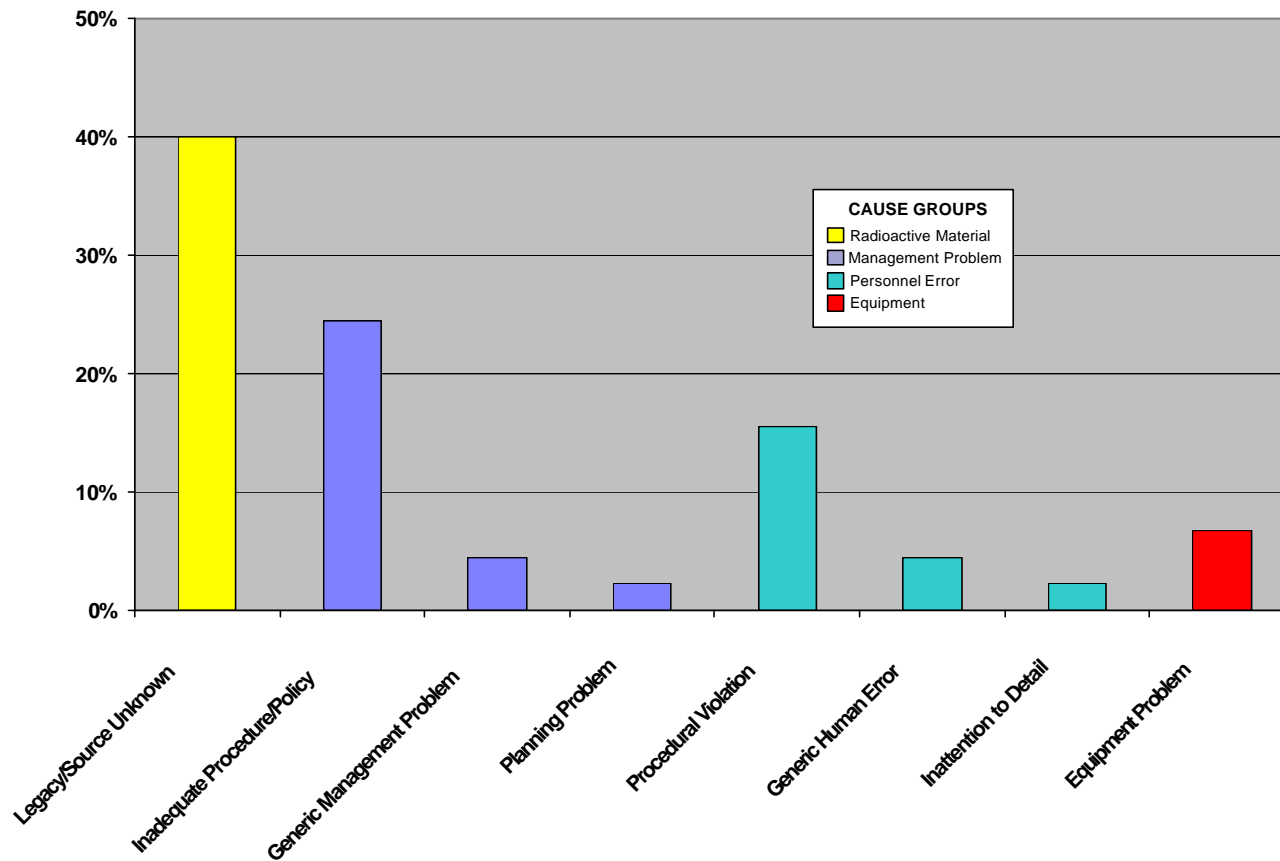| Review Period Score	
	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
	Annualized Rate
	Control Limit
	OVERALL SCORE

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Direct Causes of TA-55 Personnel Contamination Occurrences

Direct Causes
Baseline and Review

• Personnel Error and Legacy Contamination or Unknown Source predominant direct causes—44% and 40% of total, respectively

• Management and equipment problems make up remainder of direct causes

CAUSE GROUPS
- Personnel Error
- Contaminant
- Management Problem
- Equipment

Chart categories: Procedural Violation, Inattention to Detail, Generic Human Error, Legacy/Source Unknown, Inadequate Procedure/Policy, Generic Management Problem, Equipment/Material Problem

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Root Causes of TA-55 Personnel Contamination Occurrences

Root Causes
Baseline and Review

• Legacy Contamination or Unknown Source identified as root cause in 40% of contamination events—matching direct cause profile

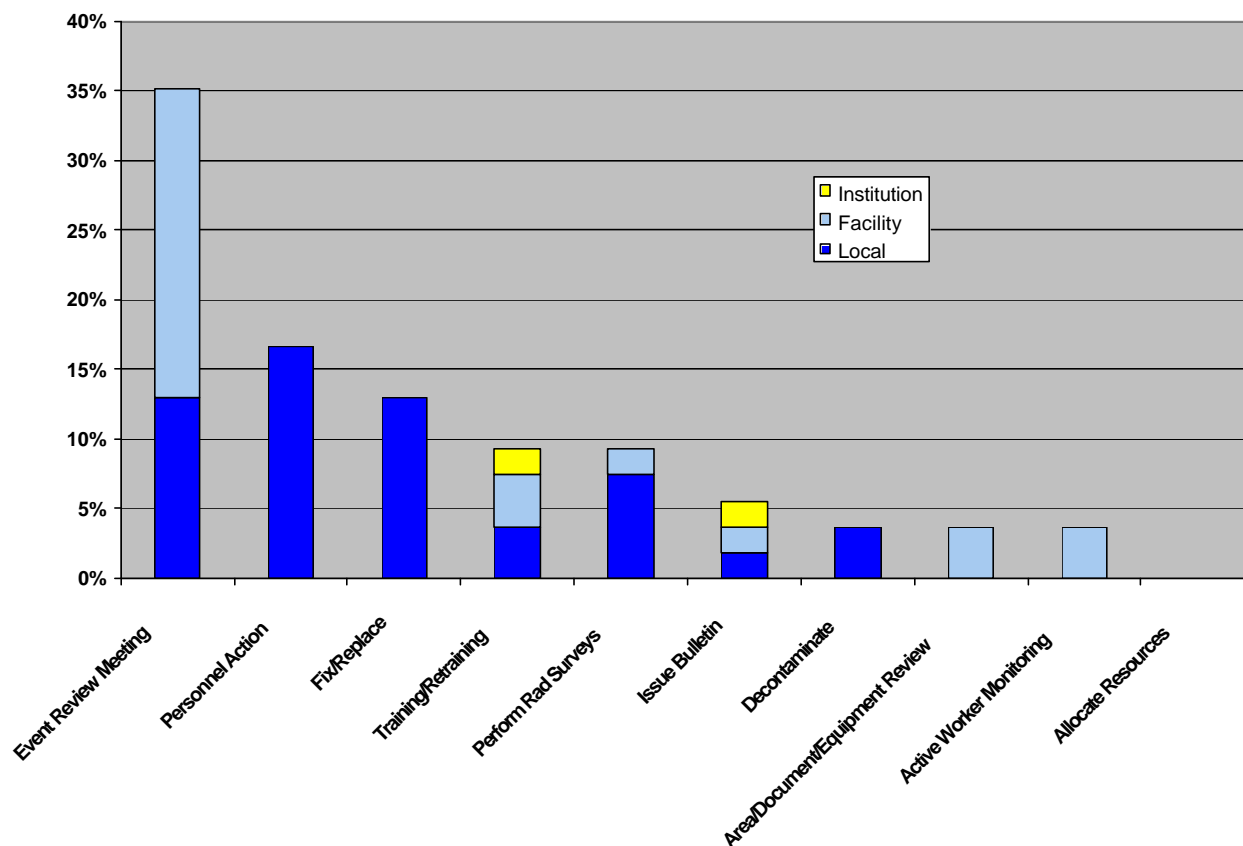• Management problems and personnel error make up most of remainder

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Profile of TA-55 Corrective Actions for Personnel Contamination Events
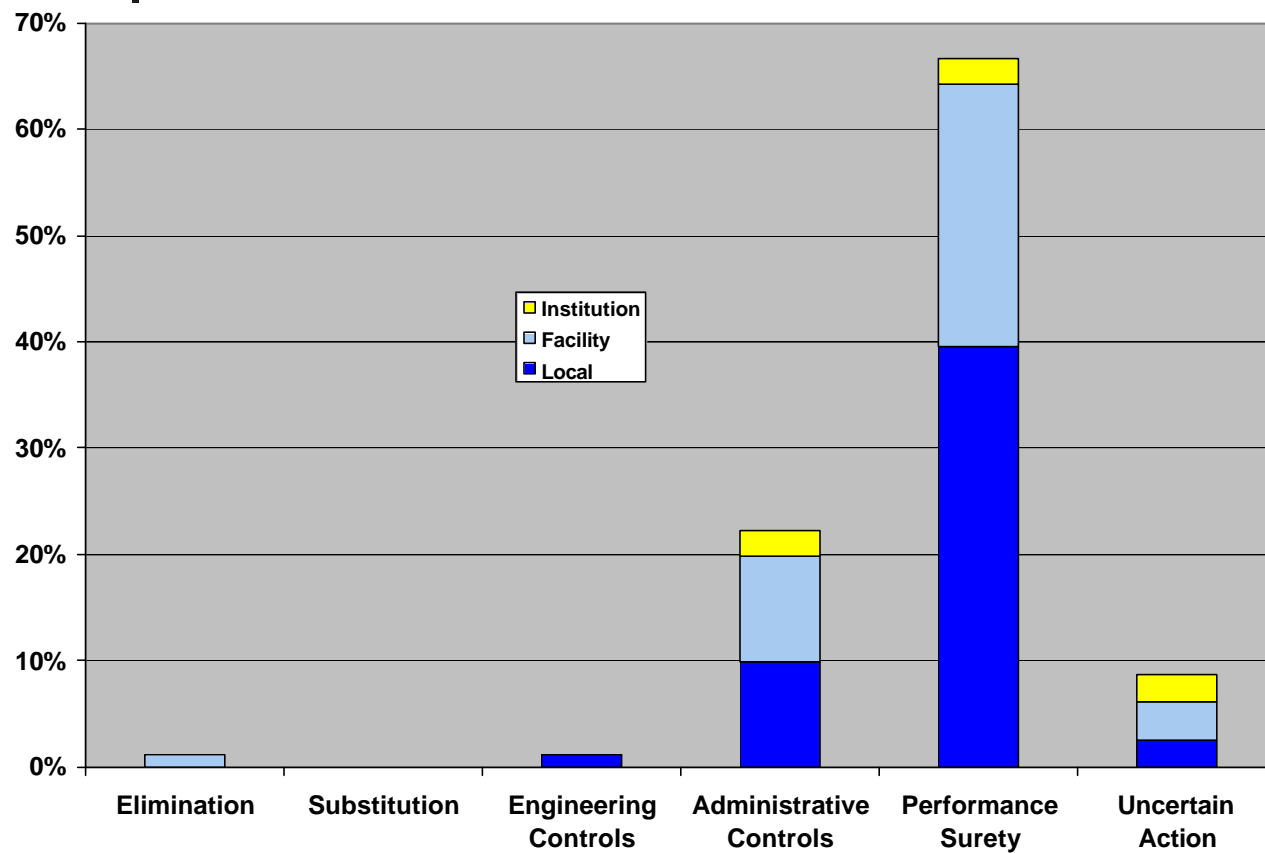
Corrective Actions
(10/01/98 to Present)

• About 1% of actions target eliminating or substituting for lesser hazard
• No actions specify new or modified engineering barriers
• Nearly 90% of all actions target procedural changes or "performance surety" actions
• 93% of actions at facility or local level

Legend:
- Institution
- Facility
- Local

X-axis categories: Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

Y-axis: 0% to 70%

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TA-55 Personnel Contamination Performance Surety Actions

Performance Surety Actions
(10/01/98 to Present)

- More than 80% of performance surety actions involve reactive, one-time actions—event meetings, disciplinary action, decon, radiation surveys, etc.
- About 96% of performance surety actions targeted at facility or local level
- Less than 5% of actions involve active worker monitoring

TA-55 Airborne Release Occurrence Performance*
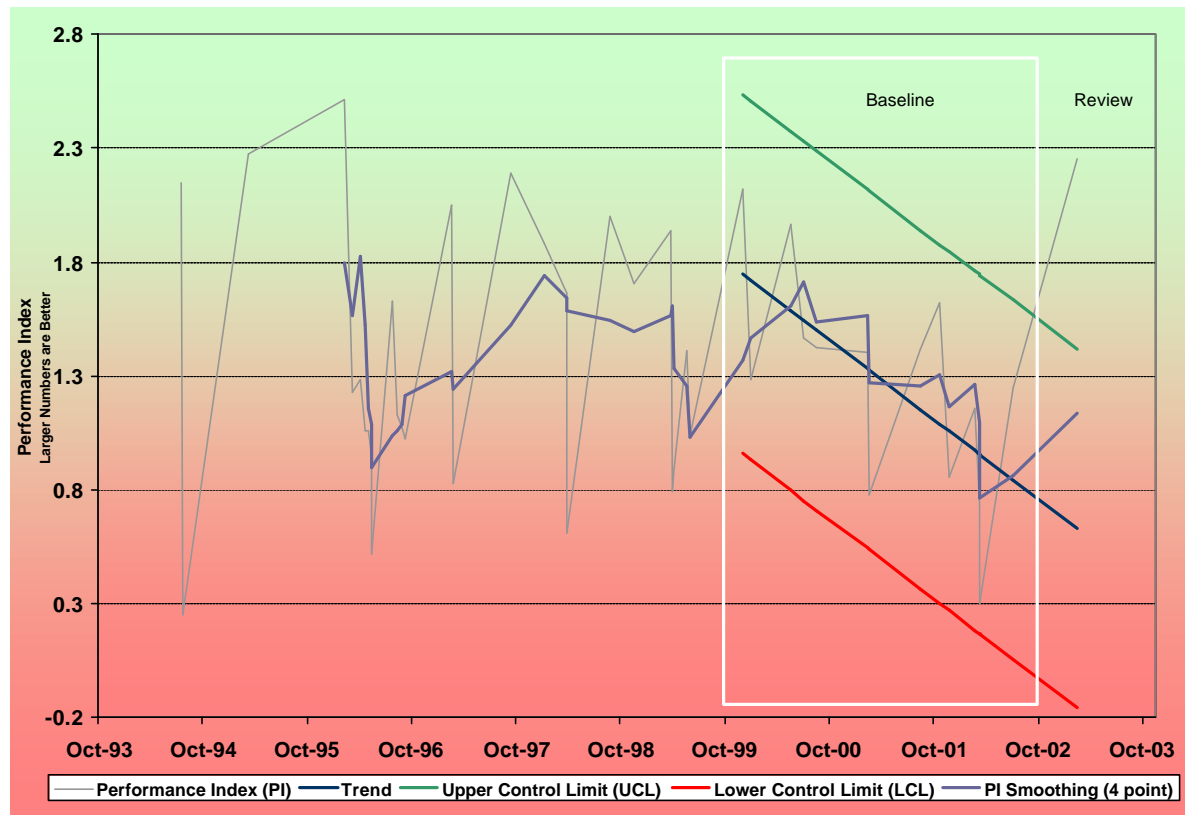
Airborne Release Control Chart
(1/94 to 4/24/03)

43 events severity weighted 2 or 3

- Pre-Baseline: 28 events
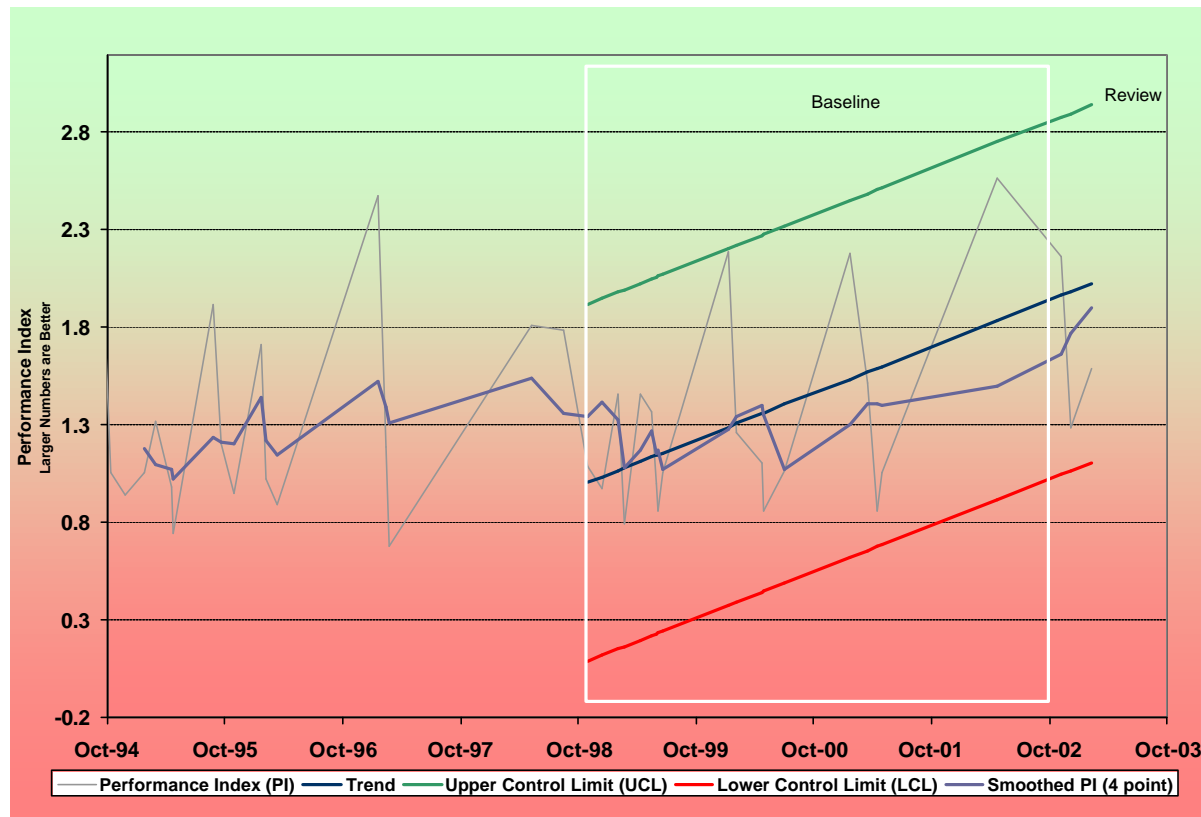- Baseline: 14 events
- Review: 1 event

Review Period Score	
☐ (yellow)	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
☐ (green)	**Annualized Rate**
☐ (green)	**Control Limit**
☐ (green)	**OVERALL SCORE**

* **Does not include TA-55 airborne events since 4/24/03**
CLICK HERE FOR UPDATED CHART

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TA-55 Personnel Safety Occurrence Performance
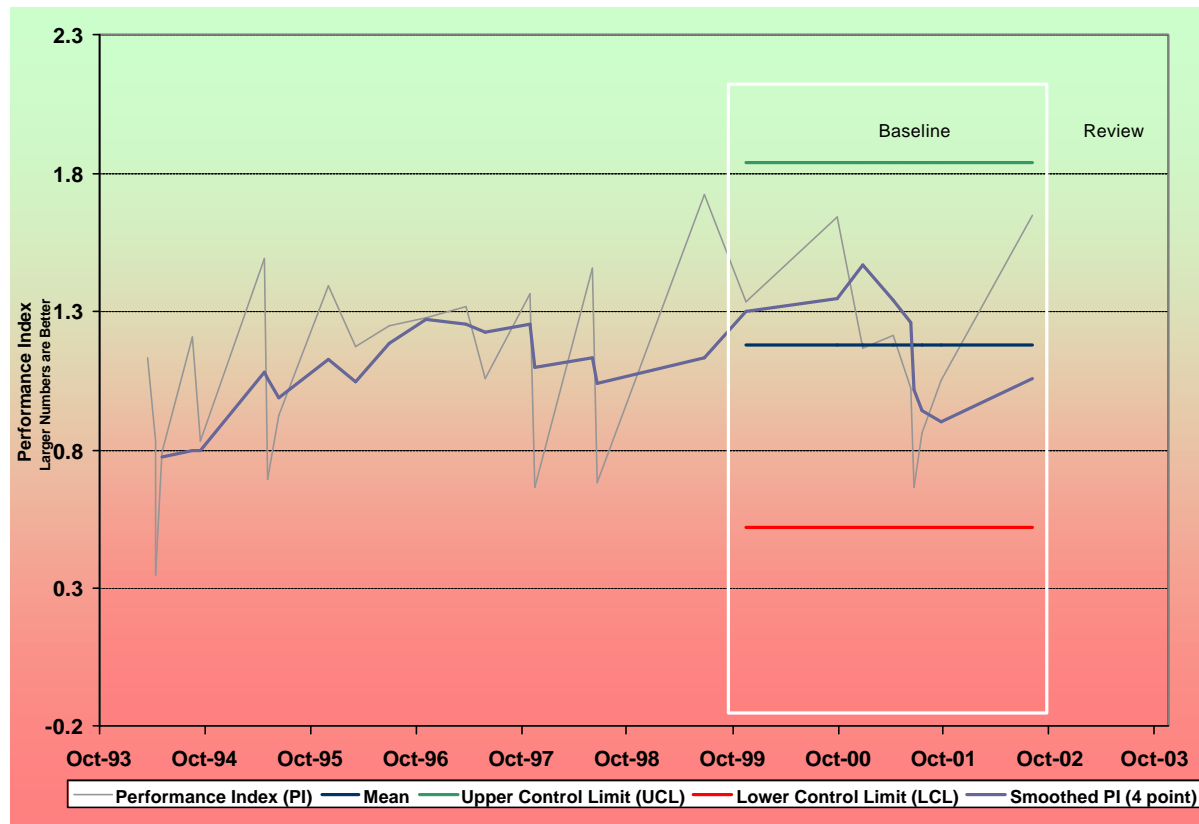

Personnel Safety Control Chart
(1/94 to 4/24/03)

41 events severity weighted 2 or 3

- Pre-Baseline: 19 events
- Baseline: 19 events
- Review: 3 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟨	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Chart labels: Performance Index — Larger Numbers are Better; Baseline; Review; 2.8, 2.3, 1.8, 1.3, 0.8, 0.3, -0.2; Oct-94, Oct-95, Oct-96, Oct-97, Oct-98, Oct-99, Oct-00, Oct-01, Oct-02, Oct-03

Legend: Performance Index (PI) — Trend — Upper Control Limit (UCL) — Lower Control Limit (LCL) — Smoothed PI (4 point)

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TA-55 Authorization Basis Occurrence Performance

Authorization Basis Control Chart
(1/94 to 4/24/03)

- 30 events severity weighted 3
  - Pre-Baseline: 21 events
  - Baseline: 9 events
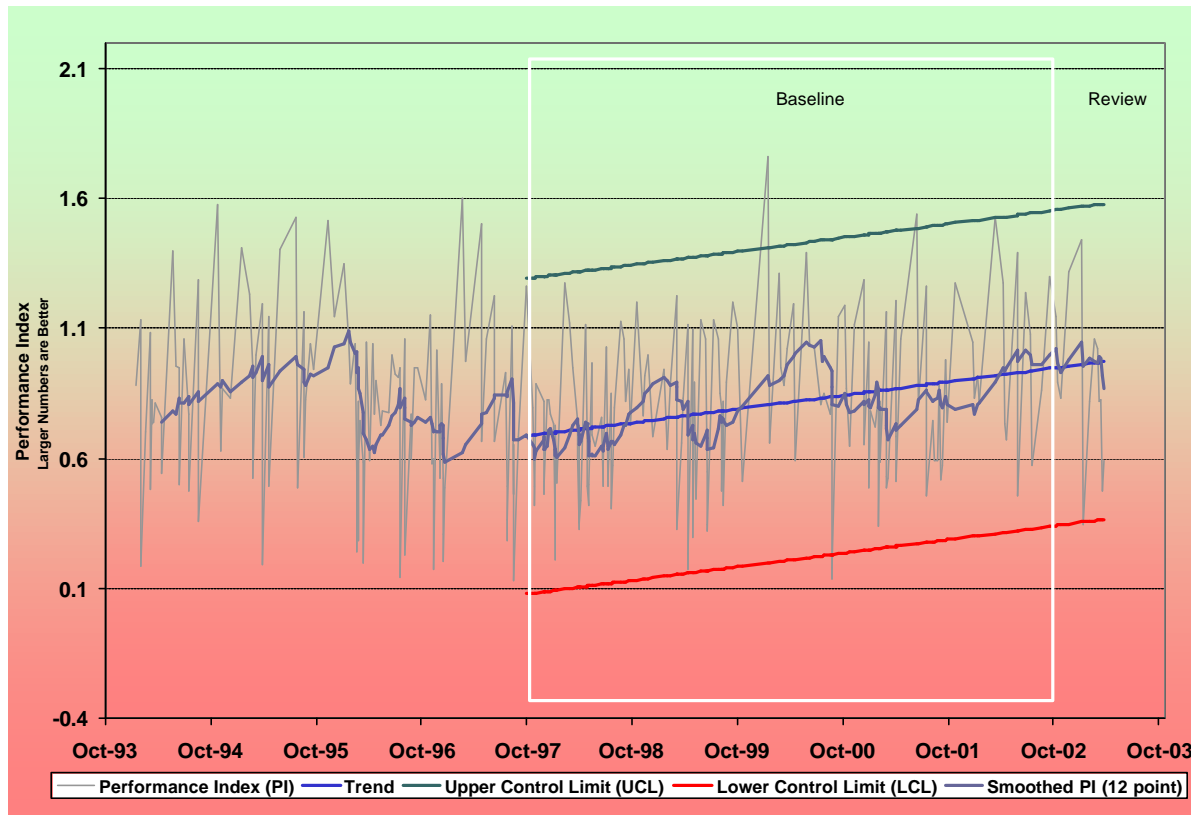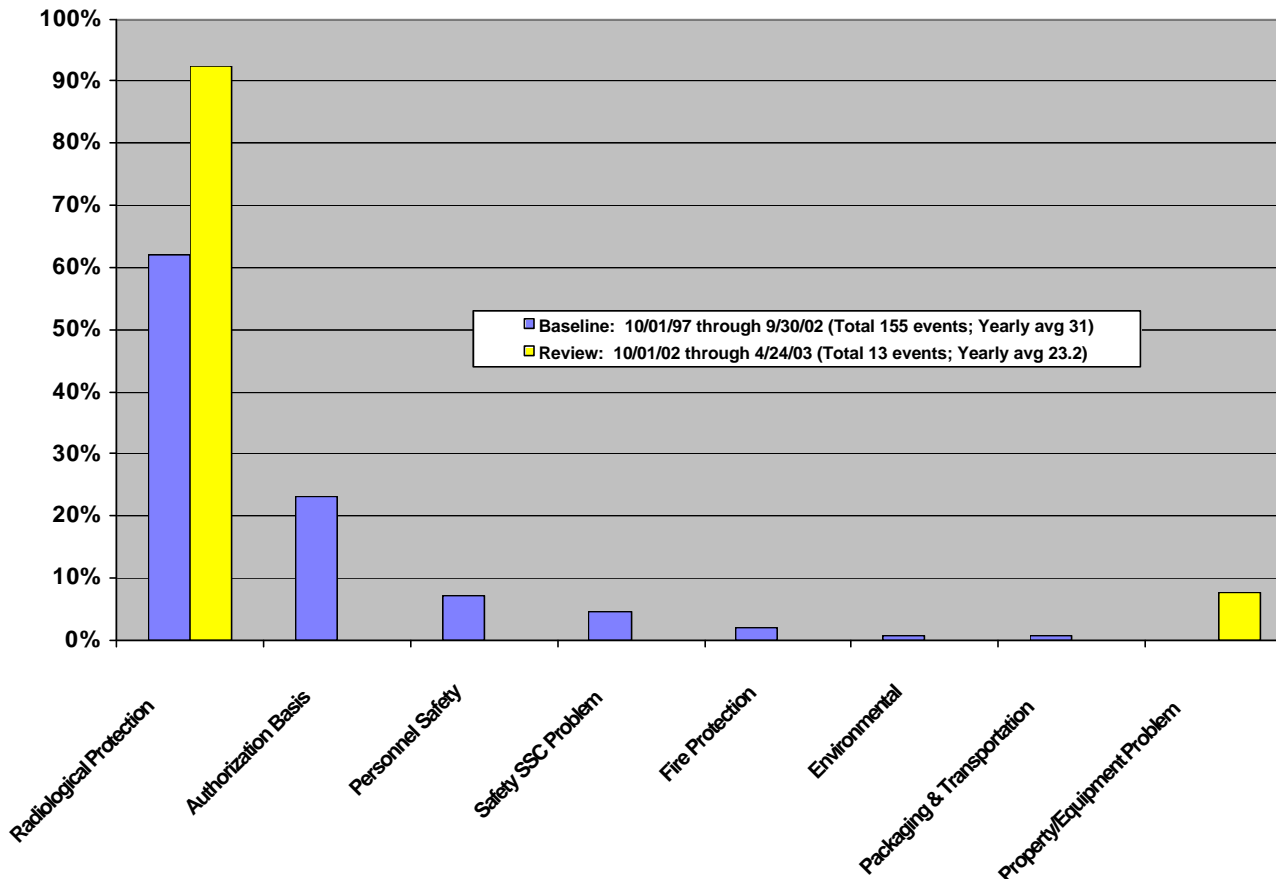 - Review: 0 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Chart legend: Performance Index (PI) | Mean | Upper Control Limit (UCL) | Lower Control Limit (LCL) | Smoothed PI (4 point)

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NMT (CMR) Division Occurrences

FY2003

(6 month)

CMR Occurrence Performance

CMR PI Control Chart
(1/94 to 4/24/03)

- 274 events severity weighted 2, 3, or 4
  - Pre-Baseline: 106 events
  - Baseline: 155 events
  - Review: 13 events

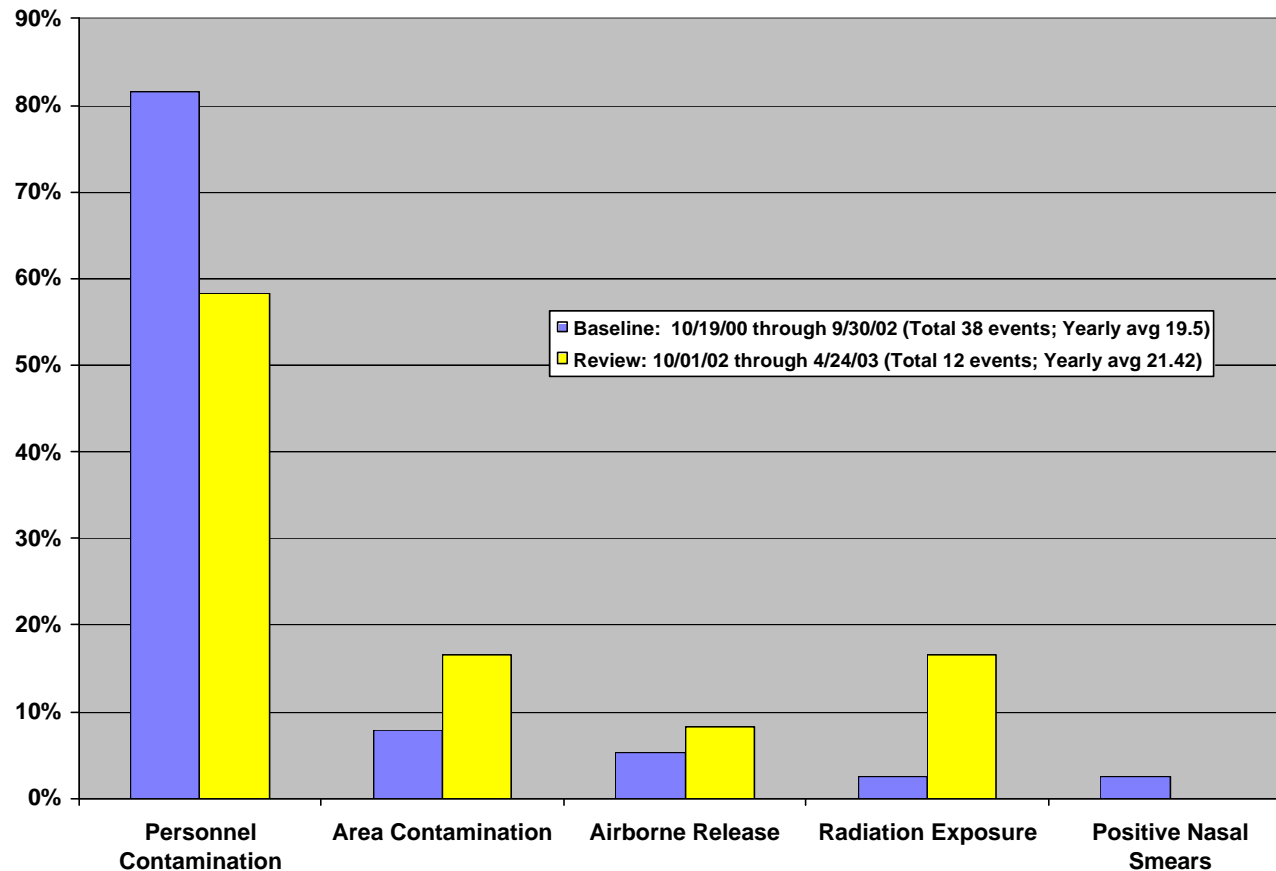| Review Period Score	
🟩	Sustained Performance
🟥	Review Period Trend
🟥	Over/Under Trend
🟩	Annualized Rate
🟥	Control Limit
🟨	OVERALL SCORE

Type Distribution of CMR Occurrences

Occurrences by Type
Baseline vs. Review

• Radiological Protection accounts for 62% in baseline and 92% in review period

• Property/Equipment Problem shows increase in review period (1 event)

• Absence of other types of occurrences for review period

Legend:
- Baseline: 10/01/97 through 9/30/02 (Total 155 events; Yearly avg 31)
- Review: 10/01/02 through 4/24/03 (Total 13 events; Yearly avg 23.2)

Y-axis: 0% to 100%

Categories:
- Radiological Protection
- Authorization Basis
- Personnel Safety
- Safety SSC Problem
- Fire Protection
- Environmental
- Packaging & Transportation
- Property/Equipment Problem

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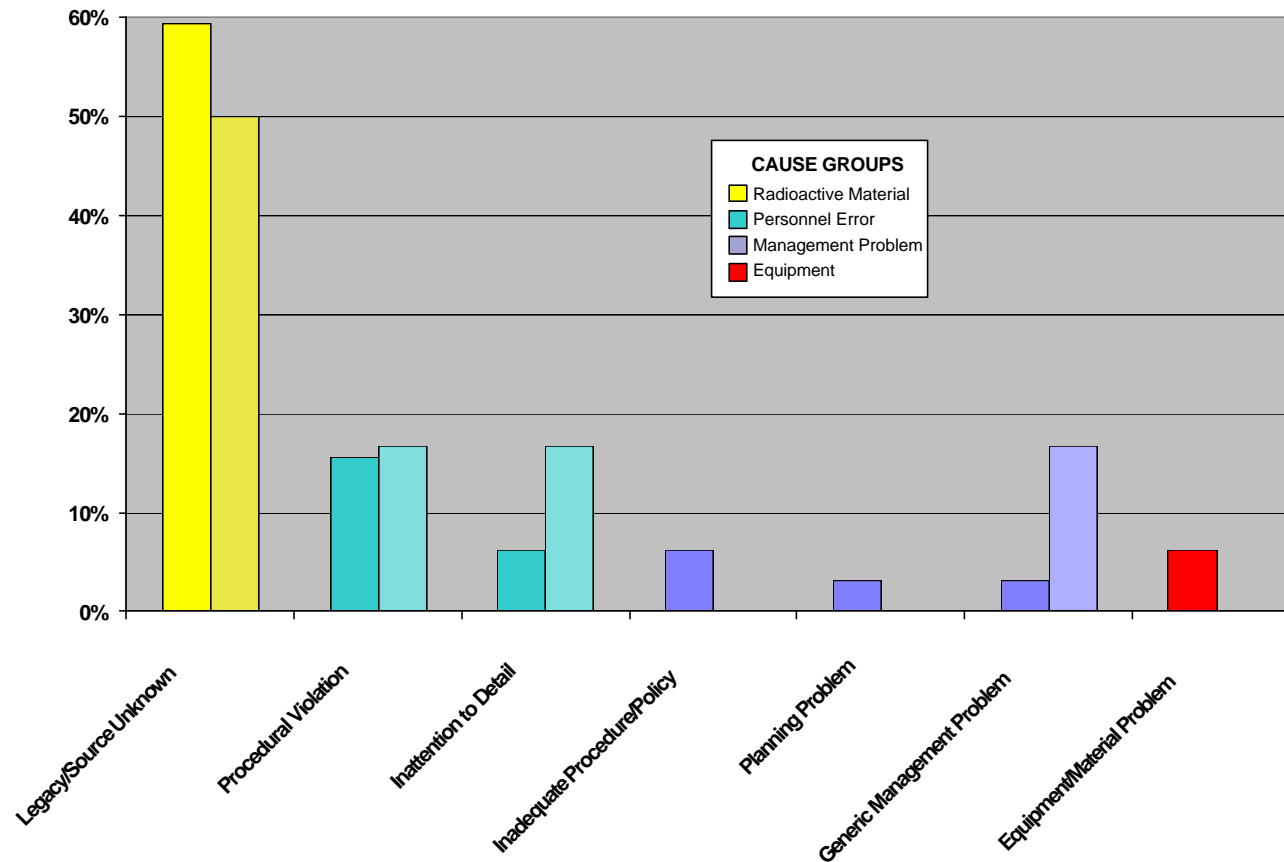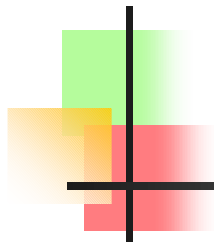# CMR Radiological Protection Occurrence Performance
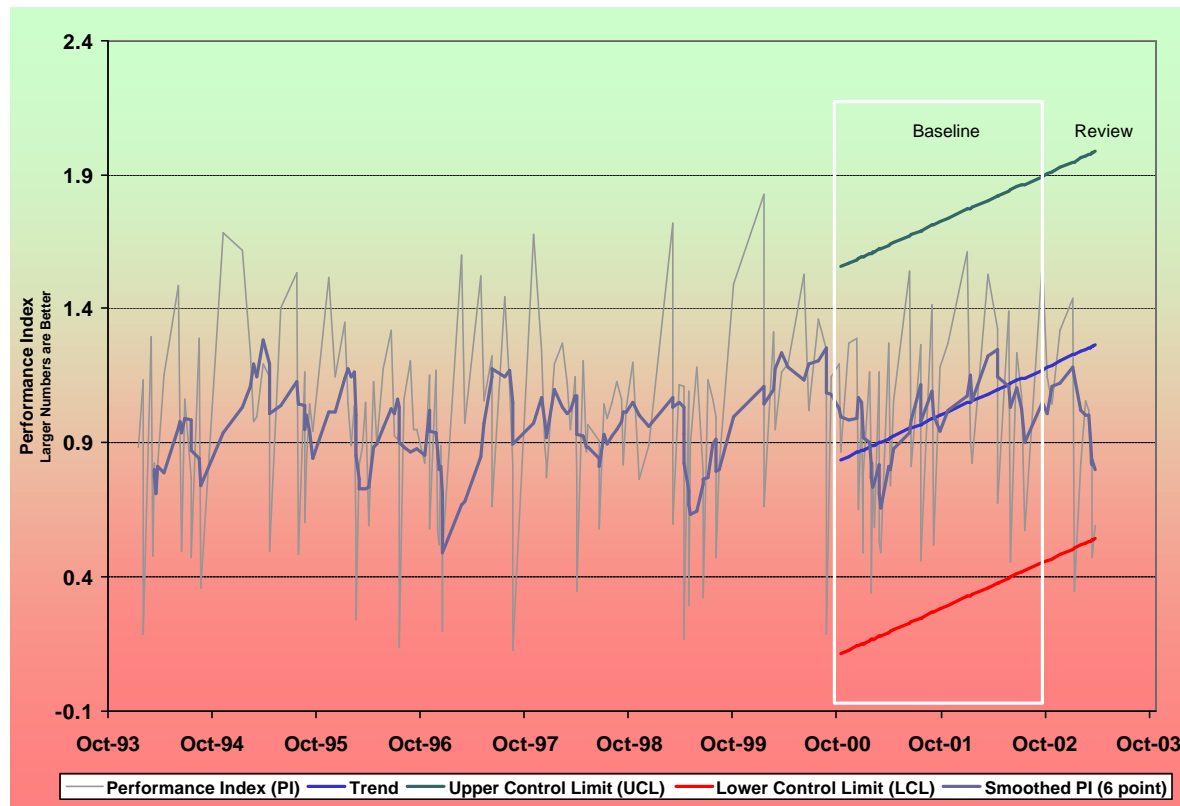
Radiological Protection Control Chart
(1/94 to 4/24/03)

- 189 events severity weighted 2, 3, or 4
  - Pre-Baseline: 139 events
  - Baseline: 38 events
  - Review: 12 events

Review Period Score	
🟨	Sustained Performance
🟥	Review Period Trend
🟥	Over/Under Trend
🟥	Annualized Rate
🟥	Control Limit
🟥	**OVERALL SCORE**

Chart legend: Performance Index (PI), Trend, Upper Control Limit (UCL), Lower Control Limit (LCL), Smoothed PI (6 point)

Y-axis: Performance Index — Larger Numbers are Better (values: 2.4, 1.9, 1.4, 0.9, 0.4, -0.1)

X-axis: Oct-93, Oct-94, Oct-95, Oct-96, Oct-97, Oct-98, Oct-99, Oct-00, Oct-01, Oct-02, Oct-03

Chart labels: Baseline, Review

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Types of CMR Radiological Protection Occurrences

CMR Radiological Occurrences by Type
Baseline vs. Review

• Personnel contamination events decrease from 82% of baseline to 58% of review

• Area contamination events increase from 8% to 17%

• Airborne release and radiation exposure events increase during review period

Legend:
- Baseline: 10/19/00 through 9/30/02 (Total 38 events; Yearly avg 19.5)
- Review: 10/01/02 through 4/24/03 (Total 12 events; Yearly avg 21.42)

Chart categories: Personnel Contamination, Area Contamination, Airborne Release, Radiation Exposure, Positive Nasal Smears

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CMR Personnel Contamination Occurrence Performance
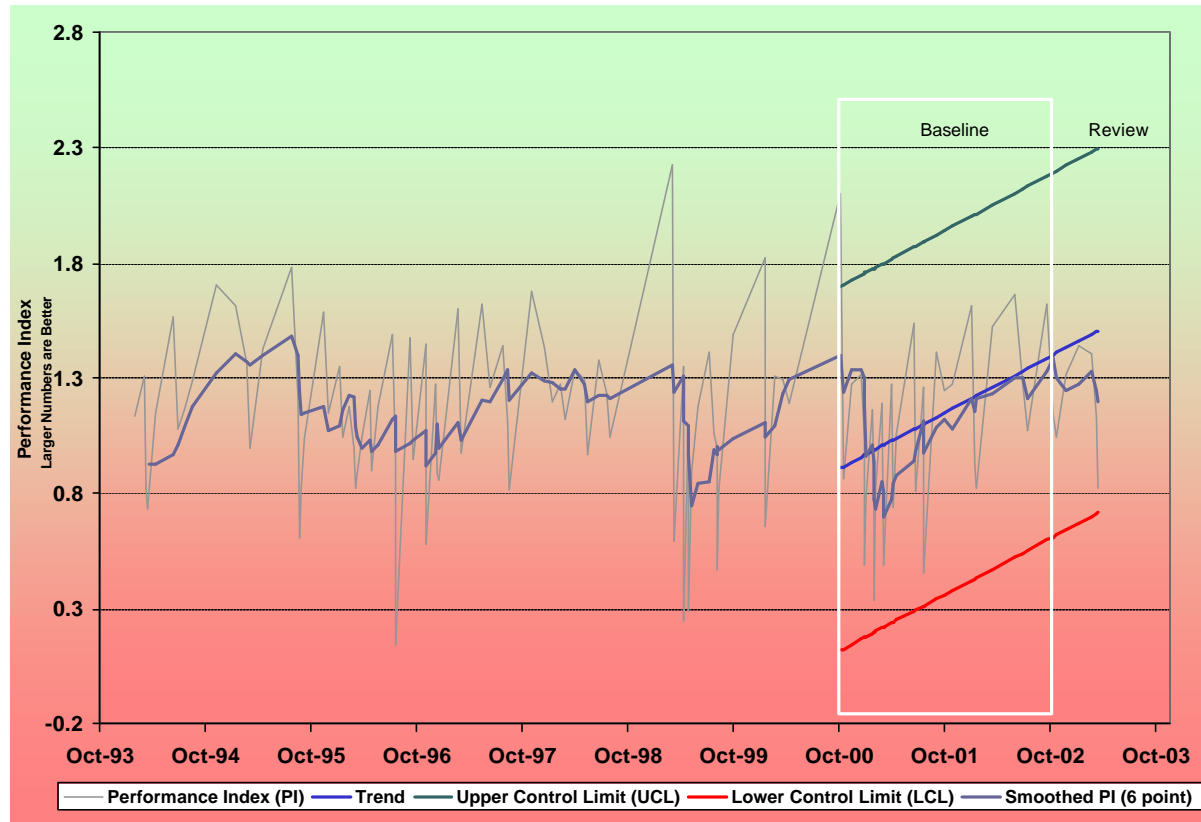
Personnel Contamination Control Chart
(1/94 to 4/24/03)

- 120 events severity weighted 2 or 3
  - Pre-Baseline: 81 events
  - Baseline: 32 events
  - Review: 7 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
🟥	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Direct Causes of CMR Personnel Contamination Occurrences

Direct Causes
Baseline vs. Review

• Nearly 60% of events in baseline and 50% in review identify legacy contamination or unknown source as direct cause
• Slight increase of Personnel error and management related direct causes
• Absence of equipment problems for review

CAUSE GROUPS
- Radioactive Material
- Personnel Error
- Management Problem
- Equipment

Chart categories: Legacy/Source Unknown, Procedural Violation, Inattention to Detail, Inadequate Procedure/Policy, Planning Problem, Generic Management Problem, Equipment/Material Problem

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Root Causes of CMR Personnel Contamination Occurrences
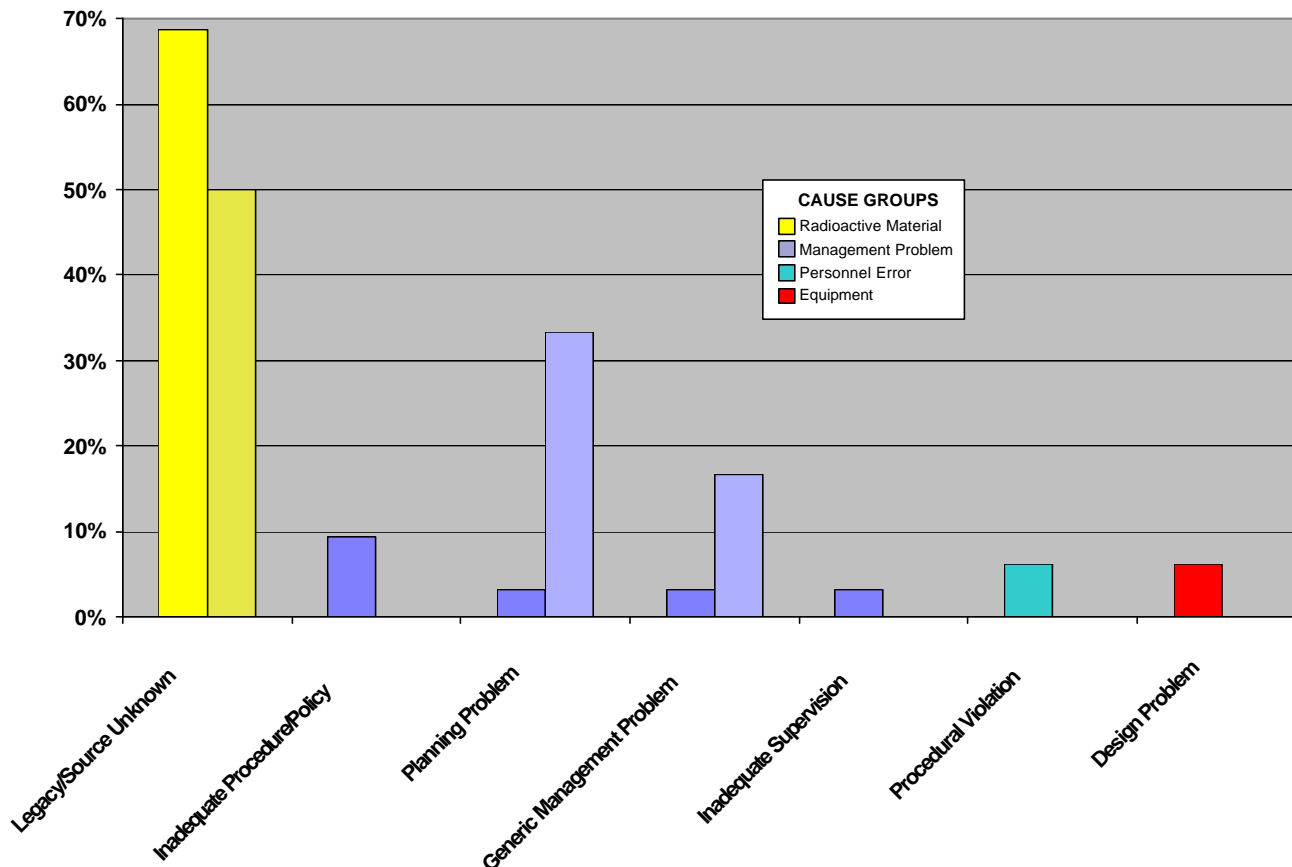
Root Causes
Baseline vs. Review

• Decrease of legacy contamination or unknown source as root cause—from 69% in baseline to 50% in review

• Increase of management-related causes from 18% in baseline to 50% in review

CAUSE GROUPS
- Radioactive Material
- Management Problem
- Personnel Error
- Equipment

Chart categories: Legacy/Source Unknown, Inadequate Procedure/Policy, Planning Problem, Generic Management Problem, Inadequate Supervision, Procedural Violation, Design Problem

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Profile of CMR Corrective Actions for Personnel Contamination Events
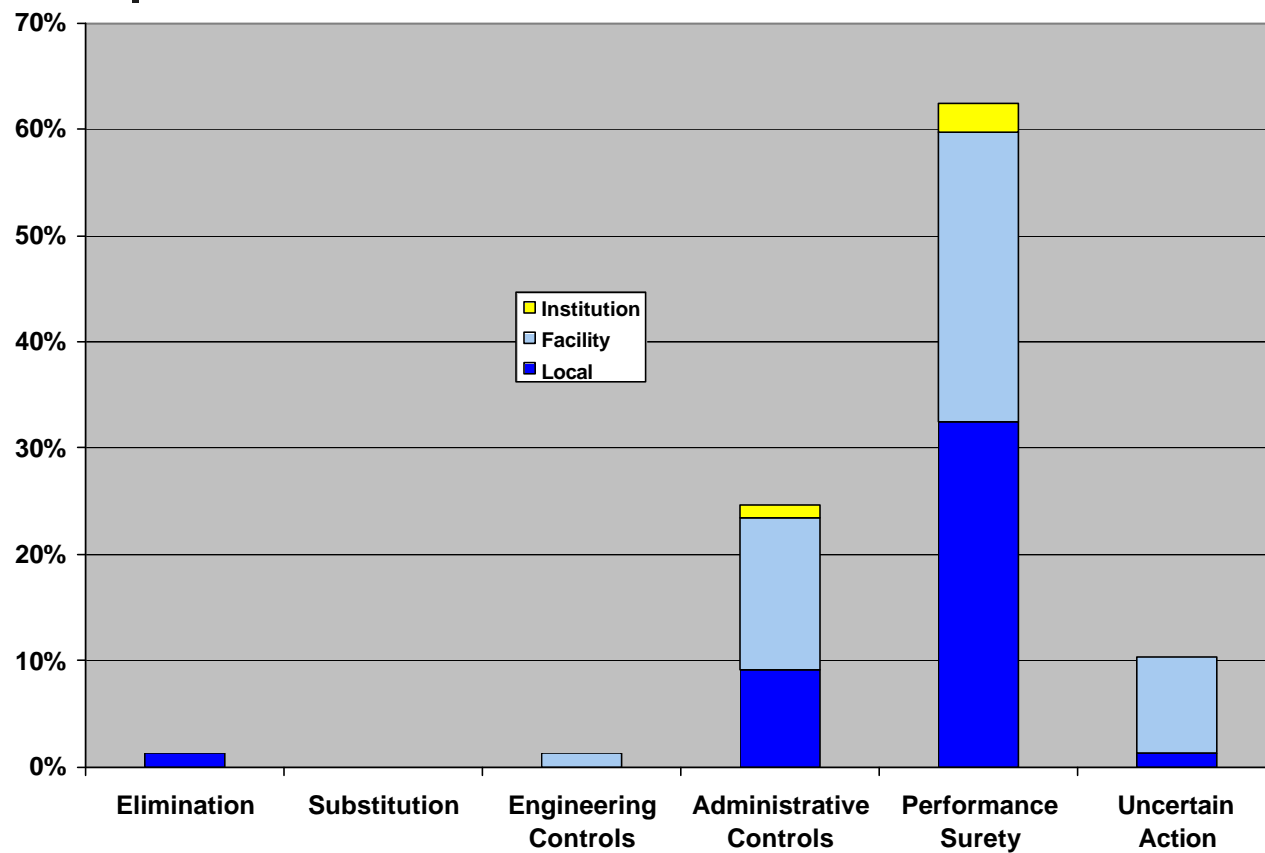
Corrective Actions
(10/01/00 to Present)

• About 1% of actions target eliminating or substituting for lesser hazard
• About 1% specify new or modified engineering barriers
• Nearly 90% of all actions target procedural changes or "performance surety" actions
• 96% of actions at facility or local level

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CMR Personnel Contamination Performance Surety Actions
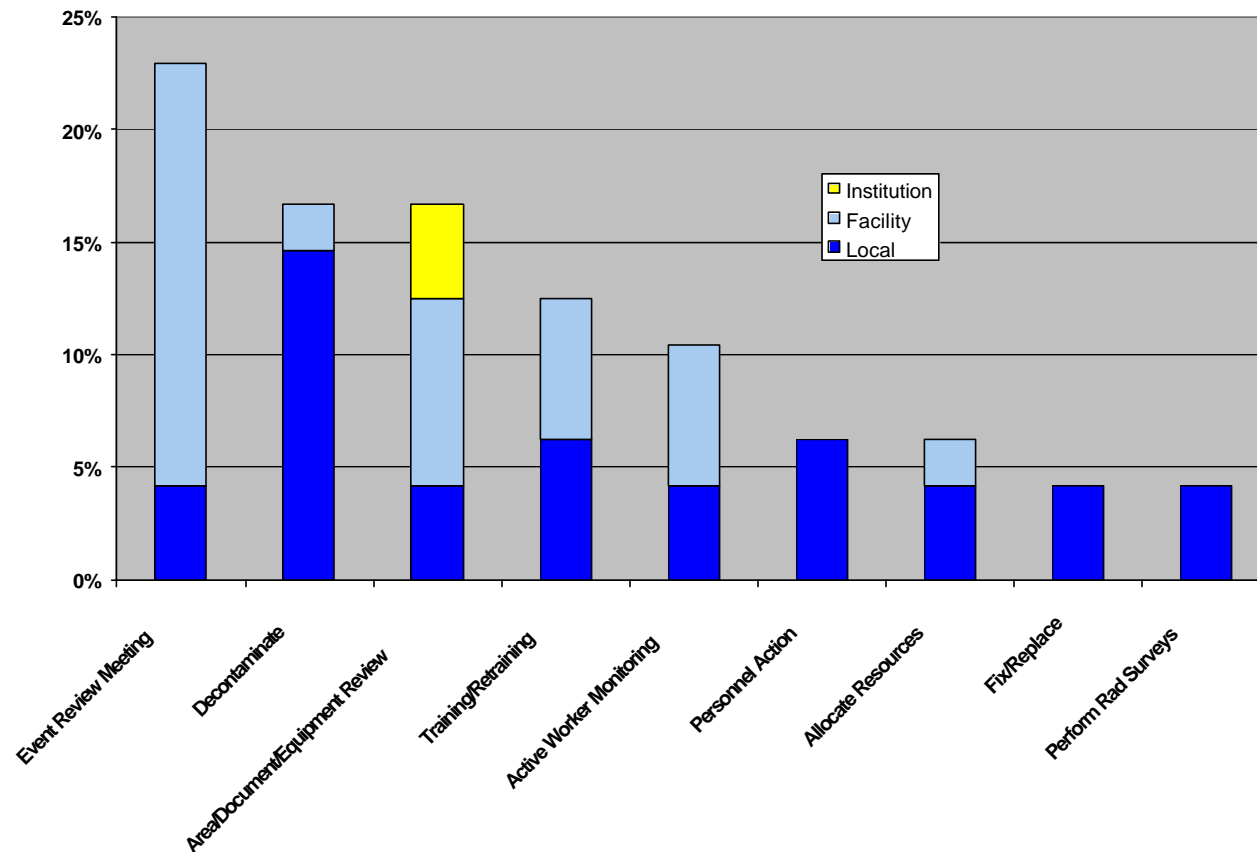
Performance Surety Actions
(10/01/00 to Present)

• About 65% of performance surety actions involve reactive, one-time actions—event meetings, decon, radiation surveys, etc.
• Nearly 96% of performance surety actions targeted at facility or local level
• About 10% of actions involve active worker monitoring

Legend:
- Institution
- Facility
- Local

Chart categories:
Event Review Meeting, Decontaminate, Area/Document/Equipment Review, Training/Retraining, Active Worker Monitoring, Personnel Action, Allocate Resources, Fix/Replace, Perform Rad Surveys

Y-axis: 0% to 25%

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CMR Area Contamination Occurrence Performance

Area Contamination Control Chart
(1/94 to 4/24/03)

- 44 events severity weighted 2 or 3
    - Pre-Baseline: 30 events
    - Baseline: 12 events
    - Review: 2 events

Review Period Score	
☐ (yellow)	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
☐ (red)	Annualized Rate
☐ (red)	Control Limit
☐ (red)	OVERALL SCORE

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Direct Causes of CMR Area Contamination Occurrences

Direct Causes
Baseline and Review

• More than 60% of area contamination events identify legacy contamination or unknown source as direct cause

• About 16% identify personnel error

• 15% identify equipment/material problems
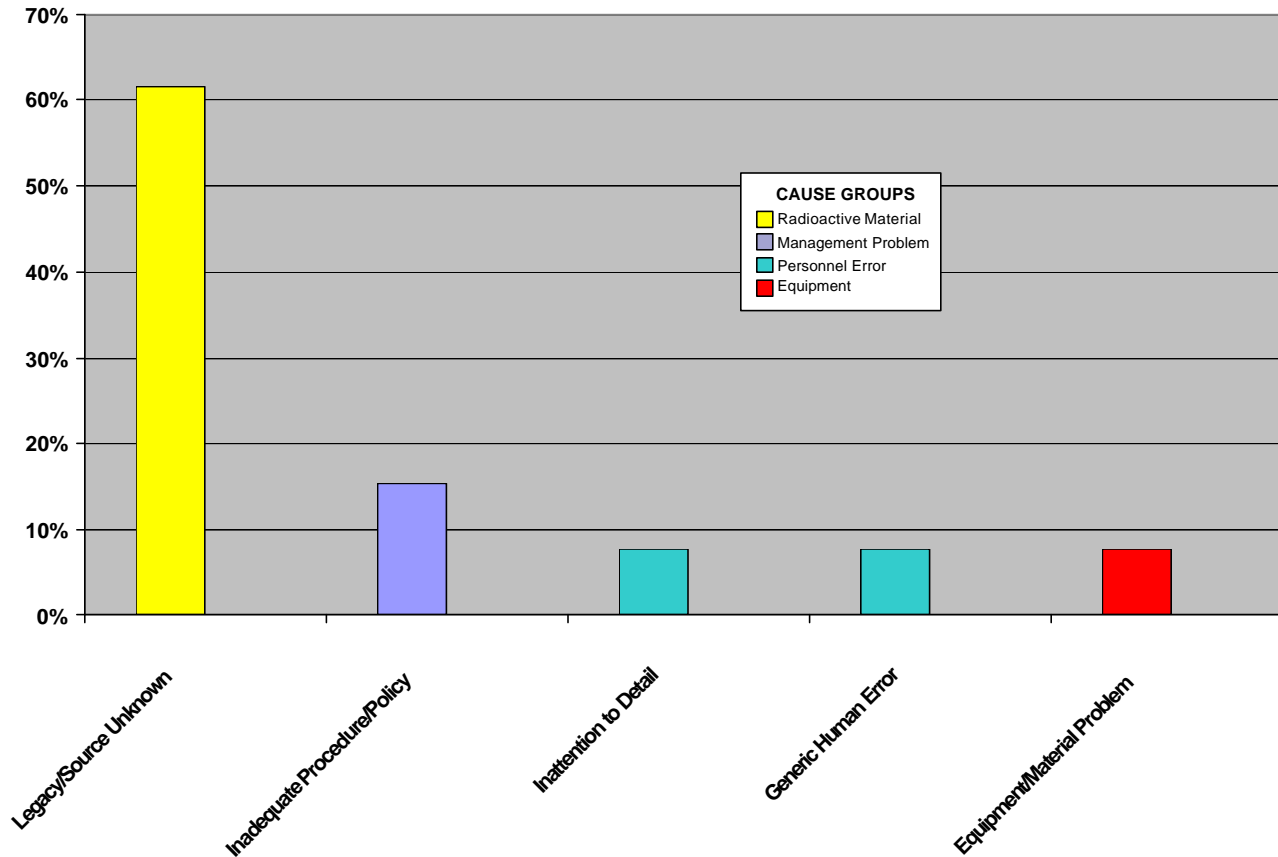
CAUSE GROUPS
- ☐ Radioactive Material
- ☐ Equipment
- ☐ Personnel Error
- ☐ External

Legacy/Source Unknown | Equipment/Material Problem | Procedural Violation | Inattention to Detail | External Problem

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Root Causes of CMR Area Contamination Occurrences

CAUSE GROUPS
- Radioactive Material
- Management Problem
- Personnel Error
- Equipment

X-axis categories:
- Legacy/Source Unknown
- Inadequate Procedure/Policy
- Inattention to Detail
- Generic Human Error
- Equipment/Material Problem

Root Causes
Baseline and Review

• More than 60% of area contamination events identify legacy contamination or unknown source as root cause

• Legacy profile matches direct causes

• 16% identify personnel error, 15% inadequate procedures, and 8% equipment problems

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Profile of CMR Corrective Actions for Area Contamination Events
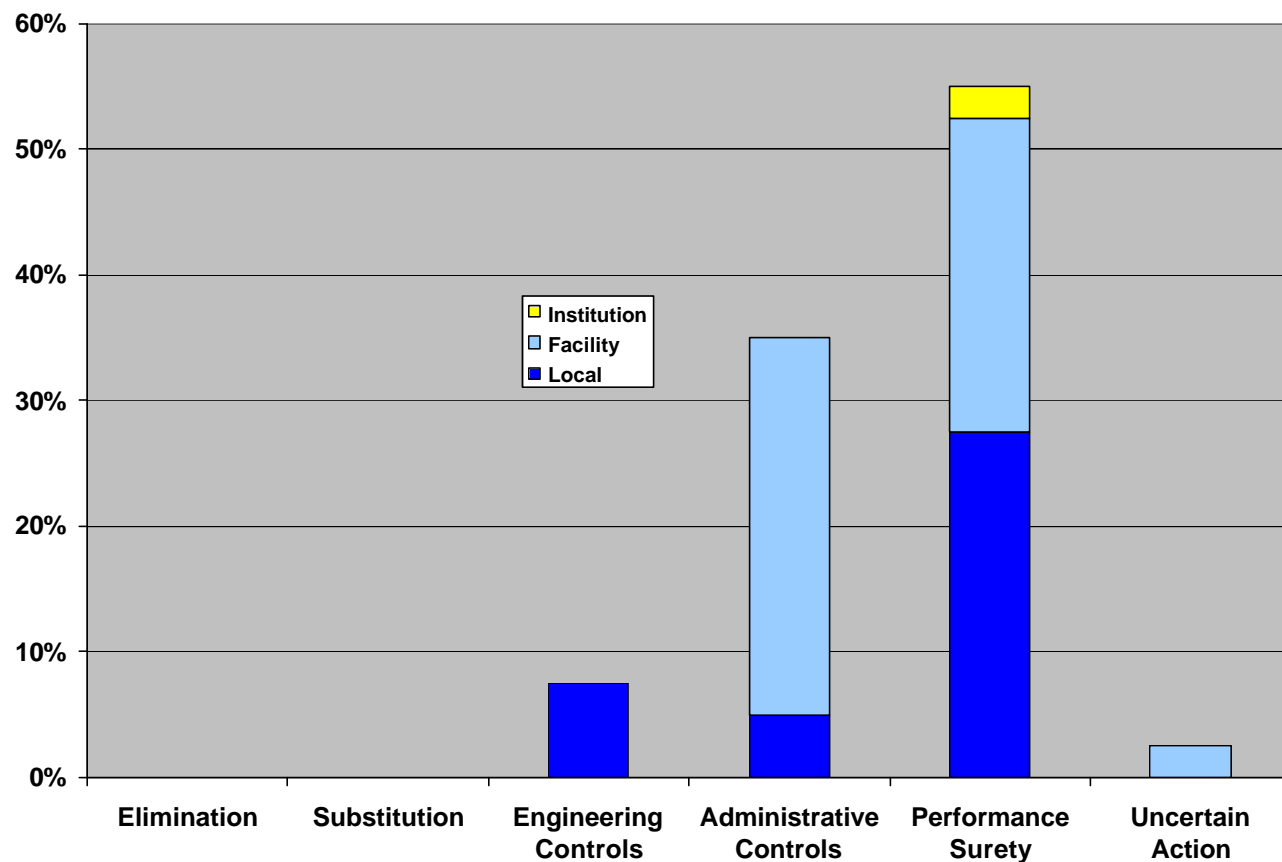
Corrective Actions
(10/01/98 to Present)

- No actions target eliminating or substituting for lesser hazard
- About 8% specify new or modified engineering barriers
- Nearly 90% of all actions target procedural changes or "performance surety" actions
- 97% of actions at facility or local level

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

Chart categories: Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

Y-axis: 0% to 60%

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CMR Area Contamination Performance Surety Actions
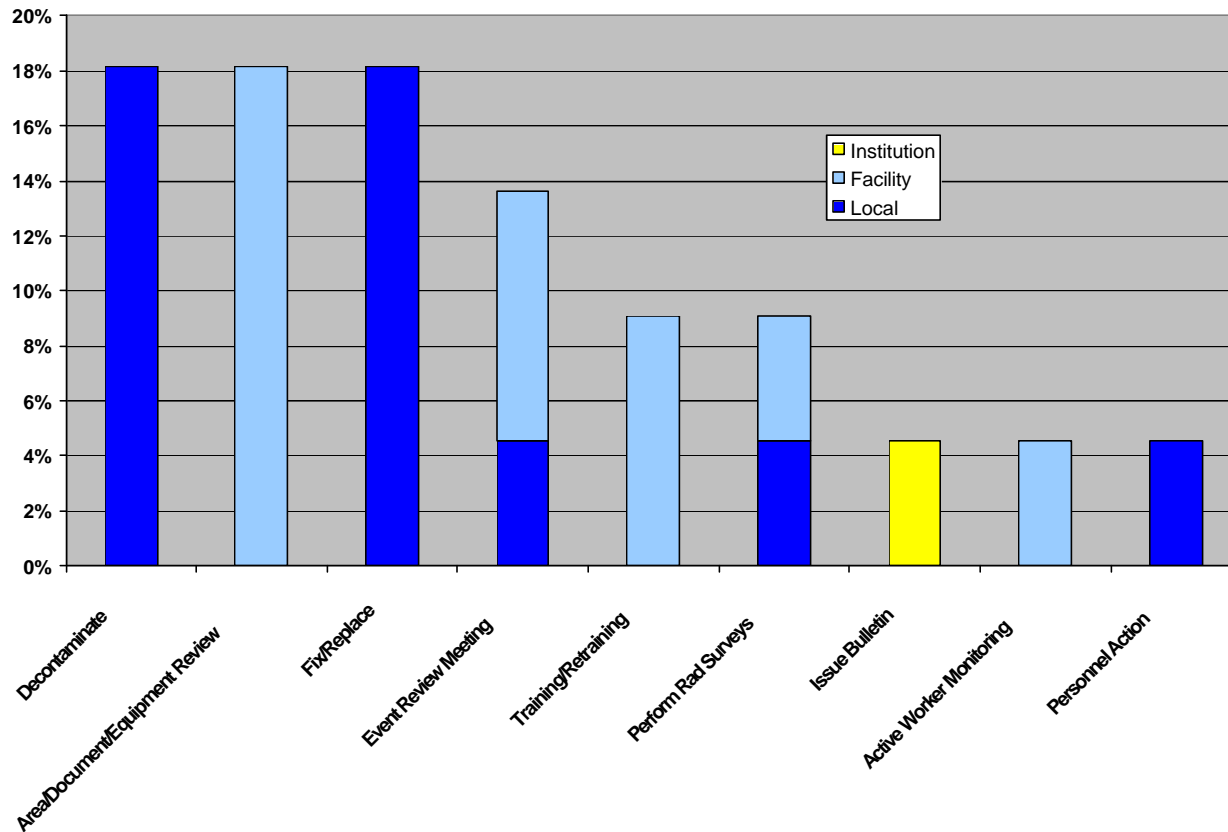
Performance Surety Actions
(10/01/98 to Present)

• About 80% of performance surety actions involve reactive, one-time actions—event meetings, decon, radiation surveys, etc.
• About 4% of actions involve institutional lessons learned notices
• About 4% of actions involve active worker monitoring, and 4% involve disciplinary action

CMR Personnel Safety Occurrence Performance
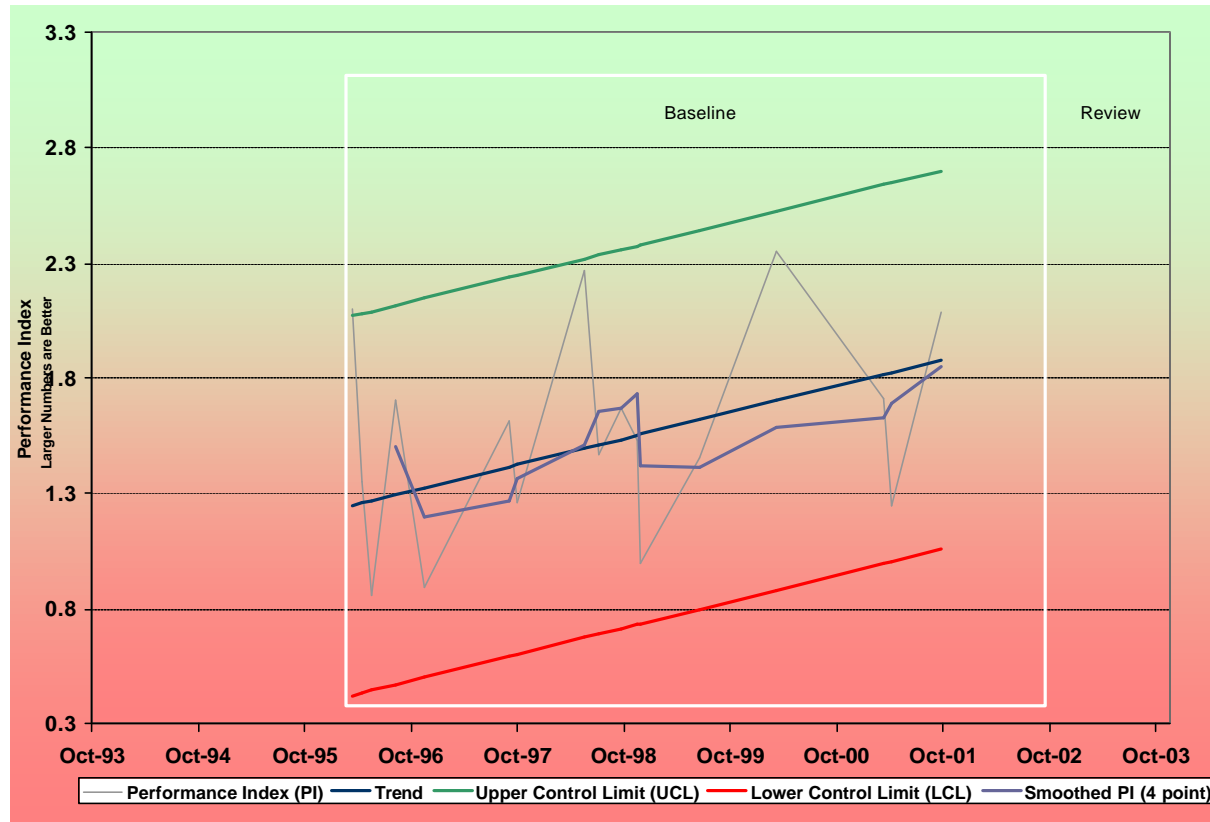
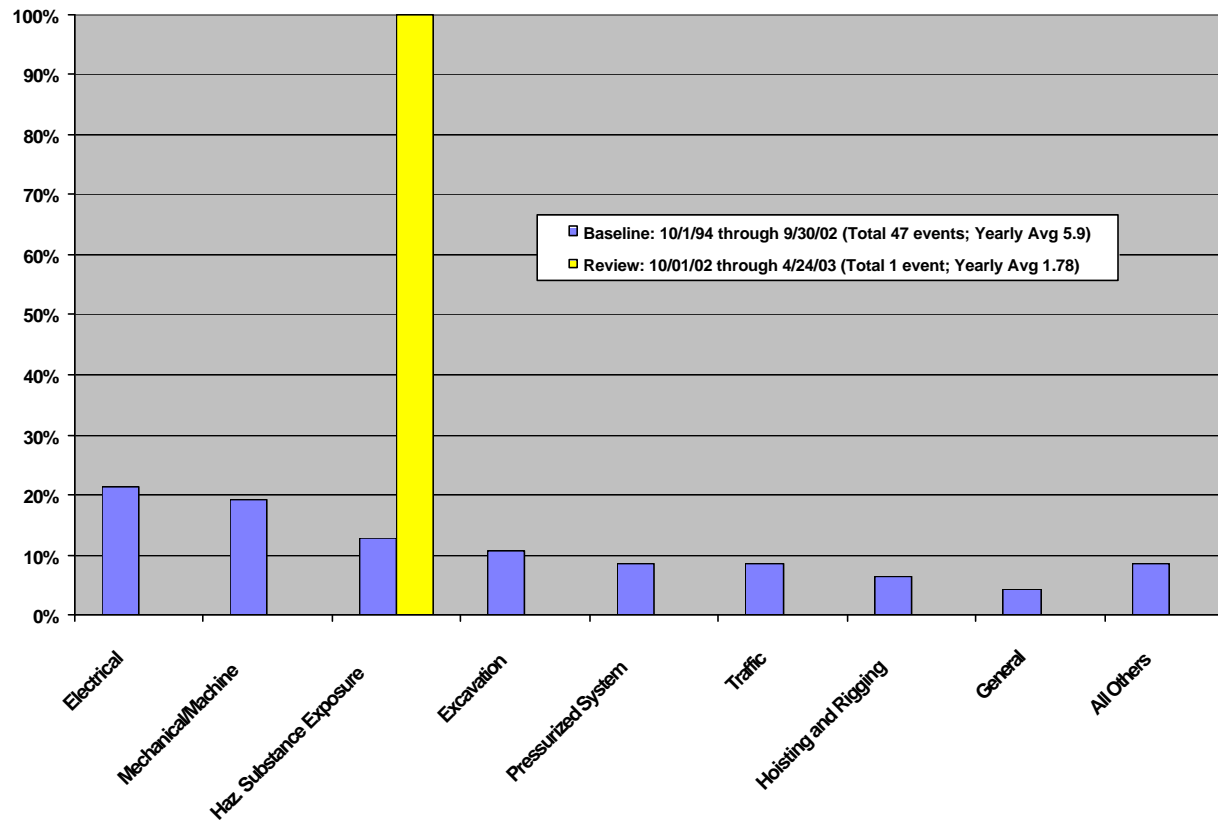**Personnel Safety Control Chart**
(1/94 to 4/24/03)

- 18 events severity weighted 2, 3, or 4
  - Baseline: 18 events
  - Review: 0 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Los Alamos

CMR Authorization Basis Occurrence Performance

Authorization Basis Control Chart
(1/94 to 4/24/03)

- 44 events severity weighted 2, 3, or 4
  - Pre-Baseline: 30 events
  - Baseline: 14 events
  - Review: 0 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

FWO Division Occurrences

FY2003
(6 month)

Los Alamos

FWO Occurrence Performance
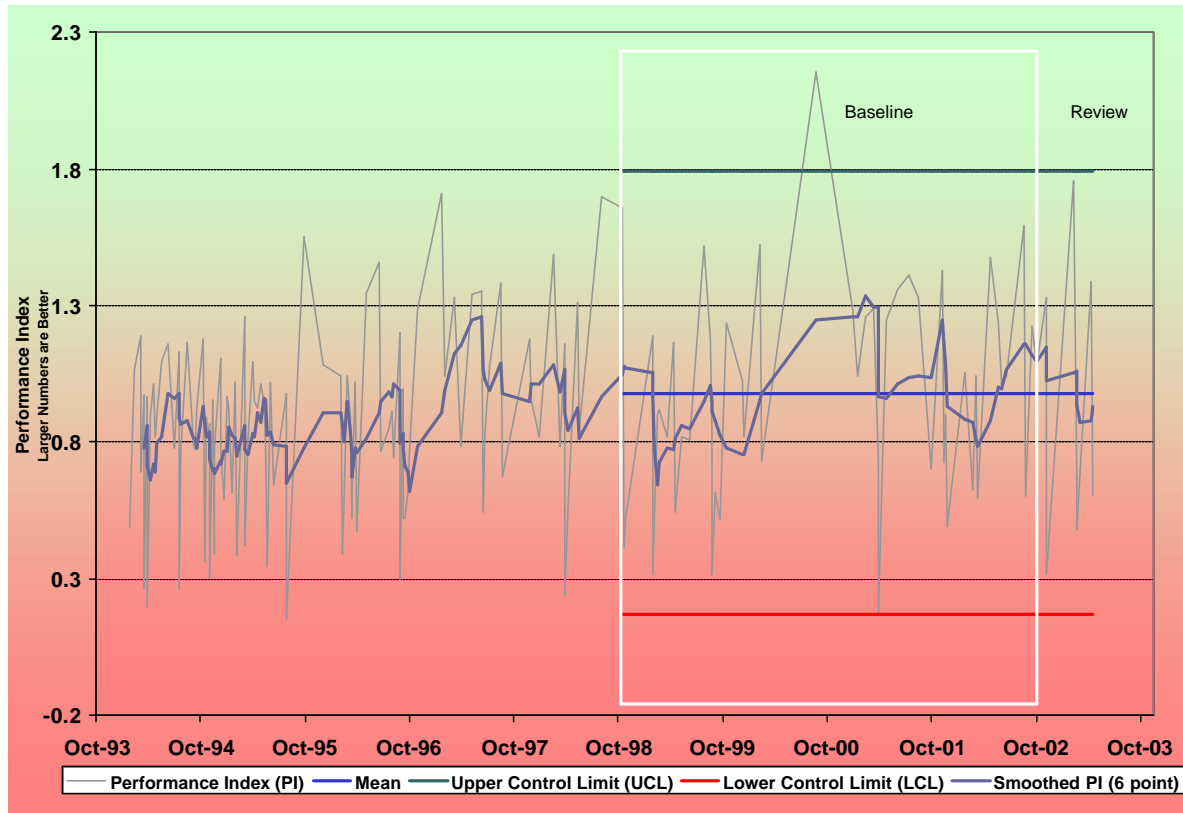
FWO PI Control Chart
(1/94 to 4/24/03)

- 161 total events severity weighted 2, 3, or 4

  - Pre-Baseline: 101 events

  - Baseline: 51 events

  - Review: 9 events

Review Period Score	
🟨	**Sustained Performance**
🟨	**Review Period Trend**
🟨	**Over/Under Trend**
🟥	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Type Distribution of FWO Occurrences
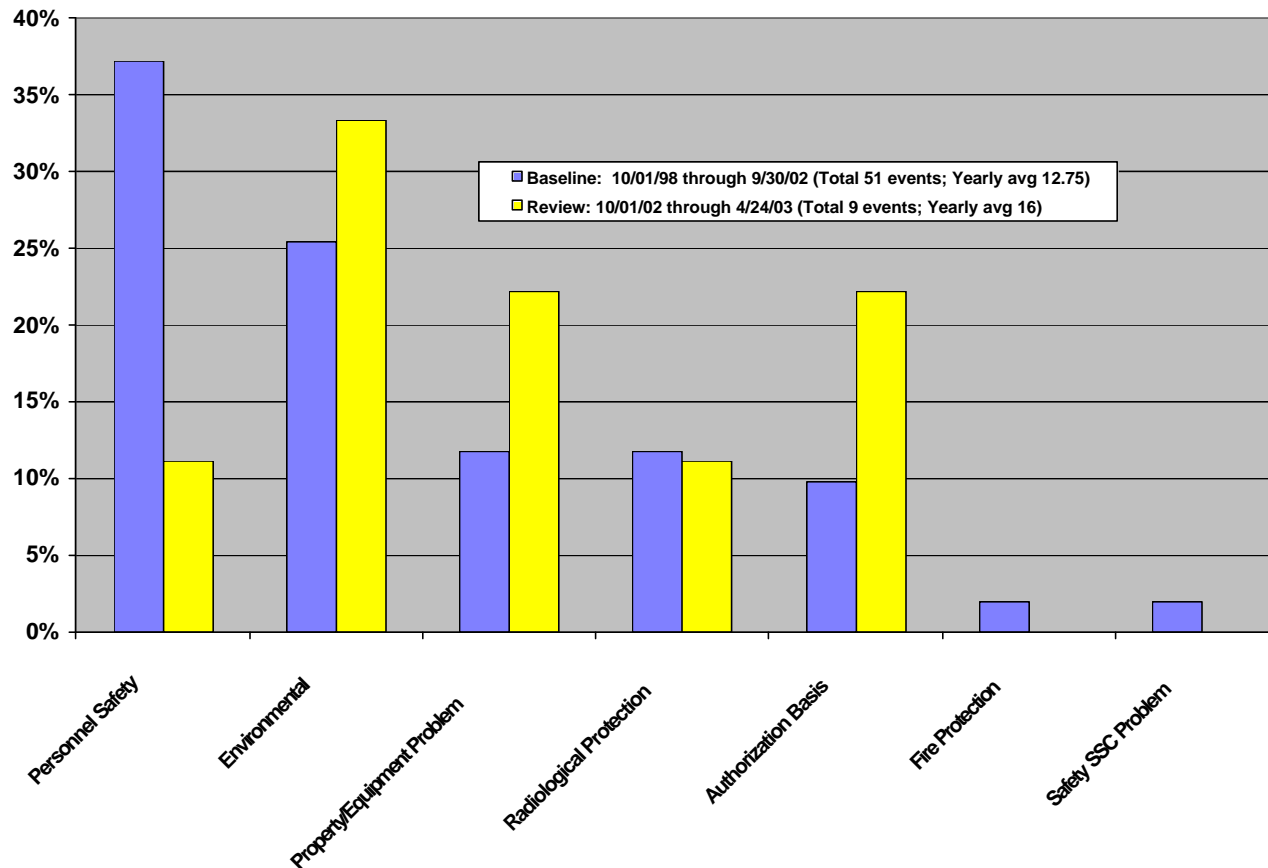
Occurrences by Type
Baseline vs. Review

- Personnel Safety decreases from 37% in baseline to 11% in review period

- Environmental, Property/Equipment, and Authorization Basis show increases from baseline to review period

Chart legend:
- Baseline: 10/01/98 through 9/30/02 (Total 51 events; Yearly avg 12.75)
- Review: 10/01/02 through 4/24/03 (Total 9 events; Yearly avg 16)

Categories: Personnel Safety, Environmental, Property/Equipment Problem, Radiological Protection, Authorization Basis, Fire Protection, Safety SSC Problem

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FWO Personnel Safety Occurrence Performance
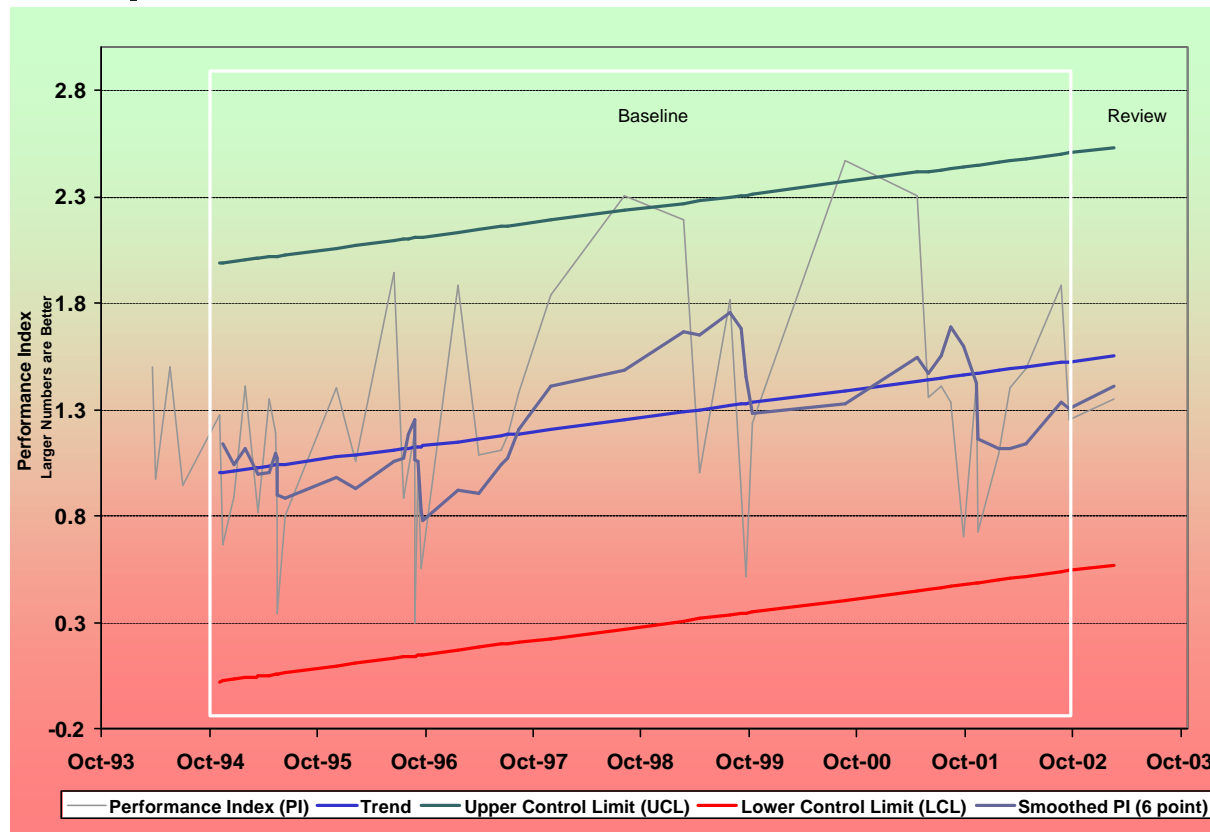
Personnel Safety Control Chart
(1/94 to 4/24/03)

- 53 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 5 events
  - Baseline: 47 events
  - Review: 1 event

Review Period Score	
🟩	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟩	Annualized Rate
N/A	Control Limit
🟩	OVERALL SCORE

Los Alamos

Types of FWO Personnel Safety Occurrences

FWO Personnel Safety Occurrences by Type
Baseline vs. Review

• Increase in Hazardous Substance Exposure from 13% to 100% (1 event)

• Absence of other personnel safety types for review period

Legend:
- Baseline: 10/1/94 through 9/30/02 (Total 47 events; Yearly Avg 5.9)
- Review: 10/01/02 through 4/24/03 (Total 1 event; Yearly Avg 1.78)

Categories: Electrical, Mechanical/Machine, Haz. Substance Exposure, Excavation, Pressurized System, Traffic, Hoisting and Rigging, General, All Others

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FWO Environmental Occurrence Performance

Environmental Control Chart
(1/94 to 4/24/03)

- 57 events severity weighted 2, 3, or 4
  - Pre-Baseline: 41 events
  - Baseline: 13 events
  - Review: 3 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟥	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Types of FWO Environmental Occurrences
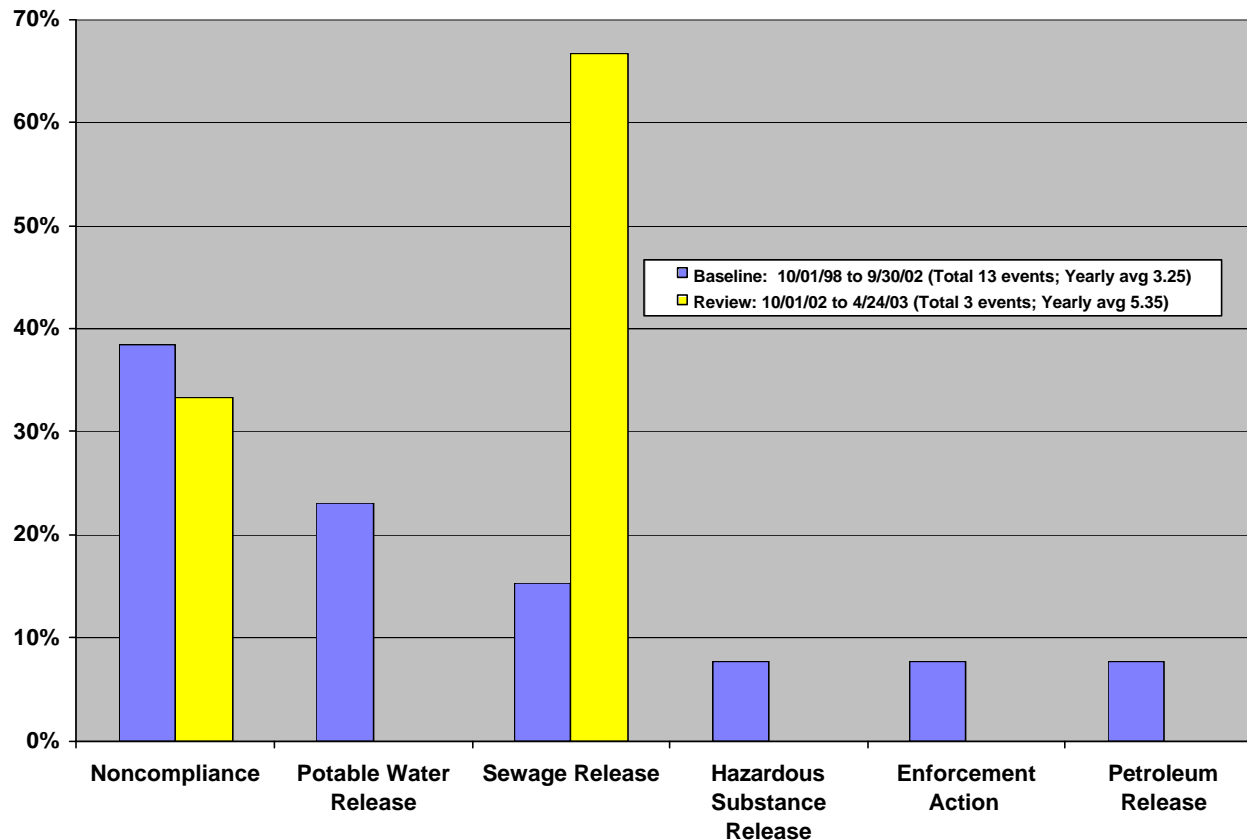
FWO Environmental Occurrences by Type
Baseline vs. Review

• Noncompliances decrease from 38% of baseline to 33% of review period (1 event)

• Sewage releases increase from 15% of baseline to 67% of review period (2 events)

Direct Causes of FWO Environmental Occurrences
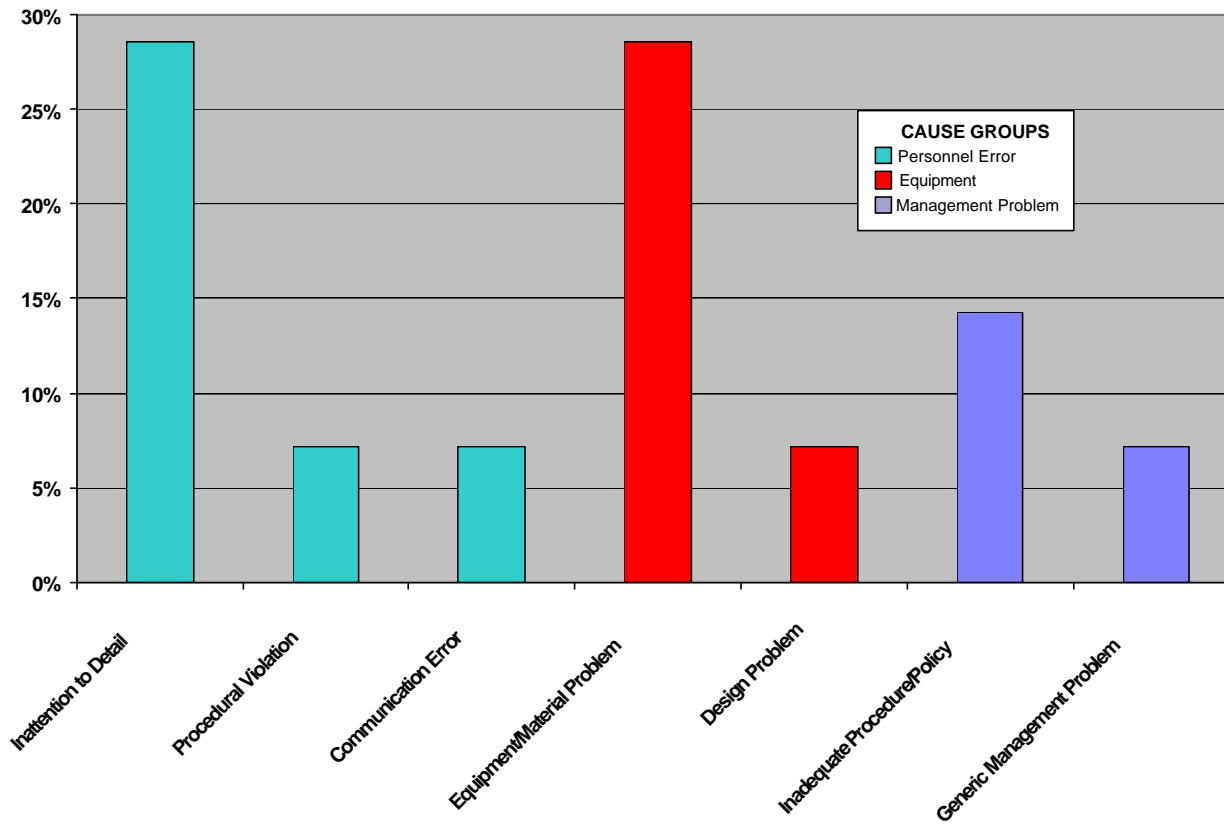
Direct Causes
Baseline and Review

• Personnel Error identified as direct cause in 43% of environmental events
• Equipment Problems identified in 36% of events
• Management Problem identified in 21% of events

CAUSE GROUPS
- Personnel Error
- Equipment
- Management Problem

Chart categories: Inattention to Detail, Procedural Violation, Communication Error, Equipment/Material Problem, Design Problem, Inadequate Procedure/Policy, Generic Management Problem

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Root Causes of FWO Environmental Occurrences
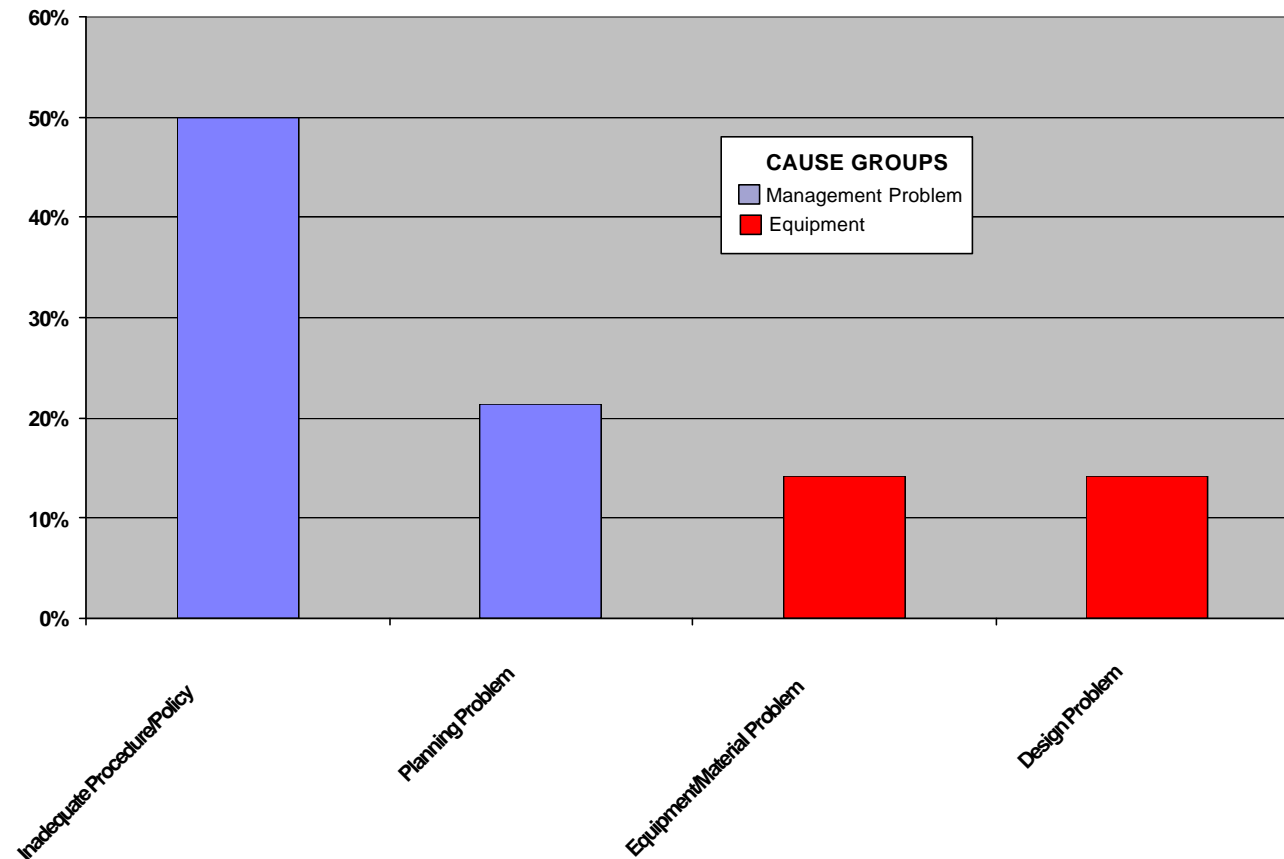
Root Causes
Baseline and Review

- Management problems identified as root cause in about 70% of environmental events for baseline and review
- Equipment problems identified in about 30% of events

CAUSE GROUPS
- Management Problem
- Equipment

Chart axis (vertical): 60%, 50%, 40%, 30%, 20%, 10%, 0%

Chart categories (horizontal): Inadequate Procedure/Policy, Planning Problem, Equipment/Material Problem, Design Problem

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Profile of FWO Corrective Actions for Environmental
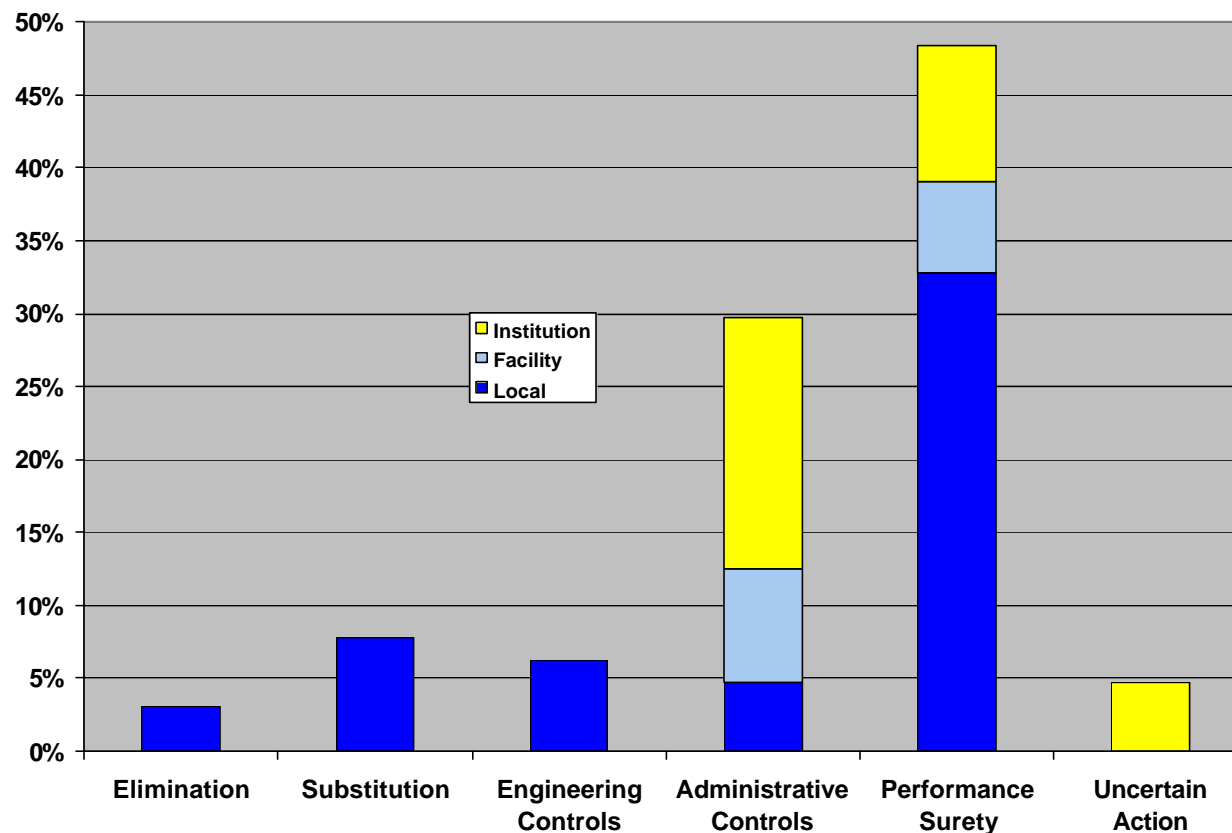
Corrective Actions
(10/01/98 to 4/24/03)

• About 11% of actions target eliminating or substituting for lesser hazard
• About 6% specify new or modified engineering barriers
• 31% of all actions targeted at institutional level
• 78% of all actions target procedural changes or "performance surety"

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FWO Performance Surety Actions for Environmental
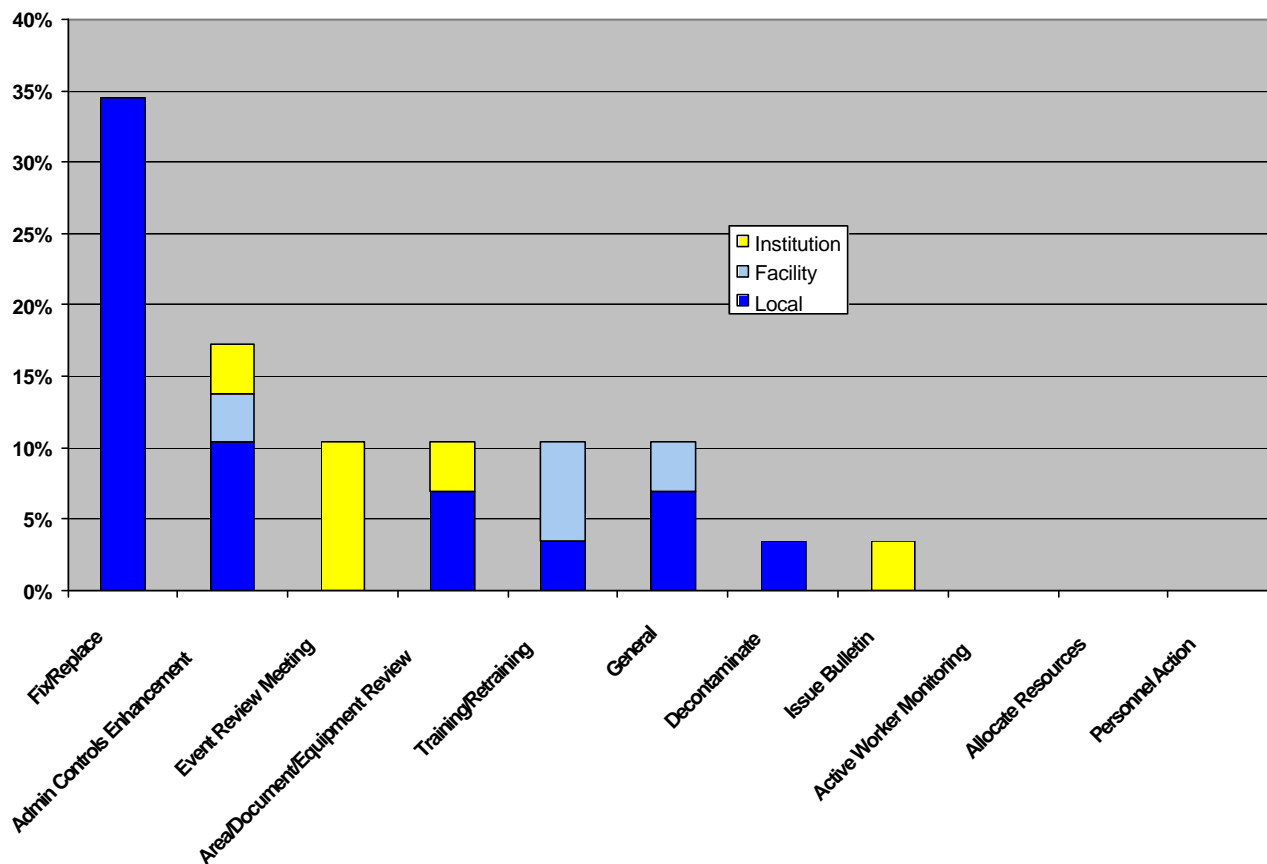
Performance Surety Actions
(10/01/98 to Present)

- Nearly 35% of performance surety actions involve fixing or replacing defective equipment or parts
- About 17% involve enhancements to existing administrative controls (i.e., increasing frequency of monitoring)
- No actions involve active monitoring of worker performance/ procedural compliance

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

X-axis categories: Fix/Replace, Admin Controls Enhancement, Event Review Meeting, Area/Document/Equipment Review, Training/Retraining, General, Decontaminate, Issue Bulletin, Active Worker Monitoring, Allocate Resources, Personnel Action

Y-axis: 0% to 40%

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FWO Radiological Protection Occurrence Performance

Radiological Protection Control Chart
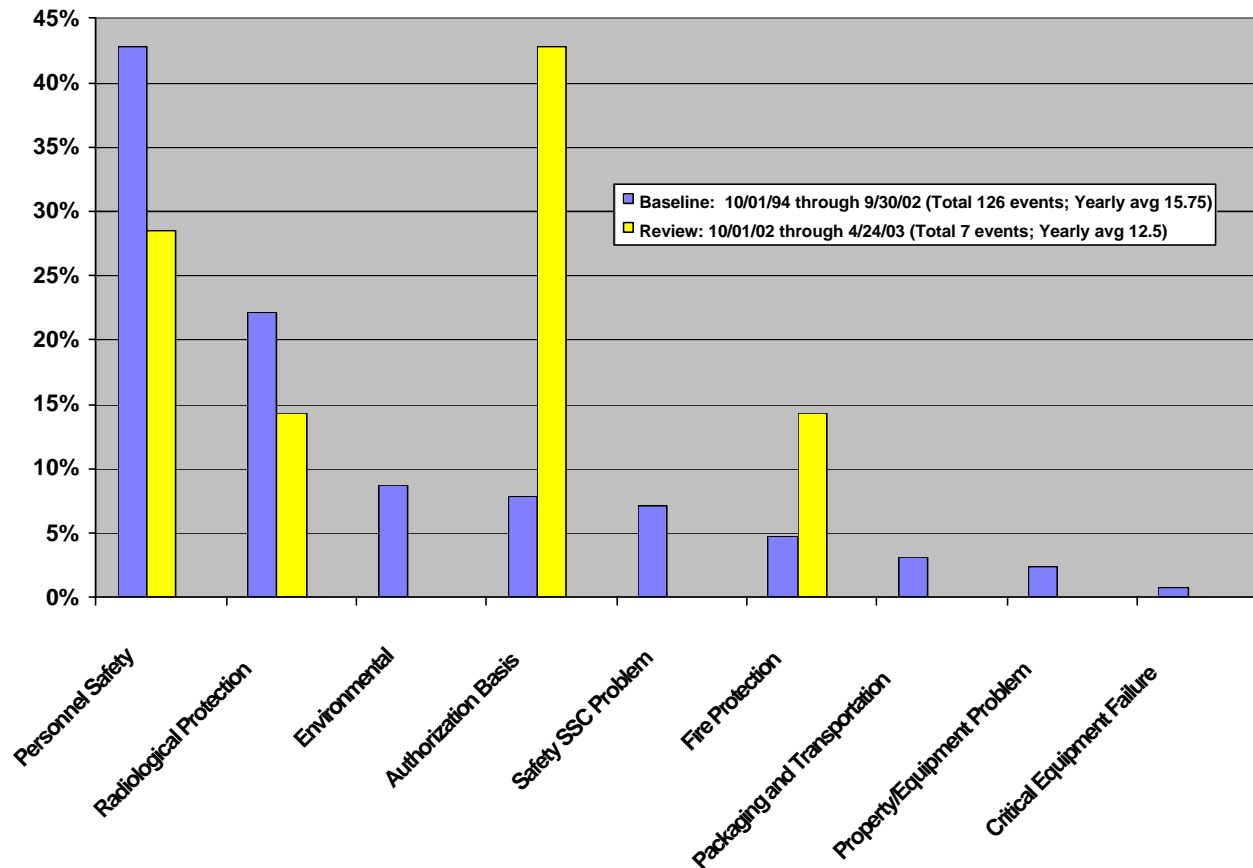(1/94 to 4/24/03)

- 21 events severity weighted 2 or 3

  - Pre-Baseline: 9 events

  - Baseline: 12 events

  - Review: 0 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

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ESA Division Occurrences

FY2003
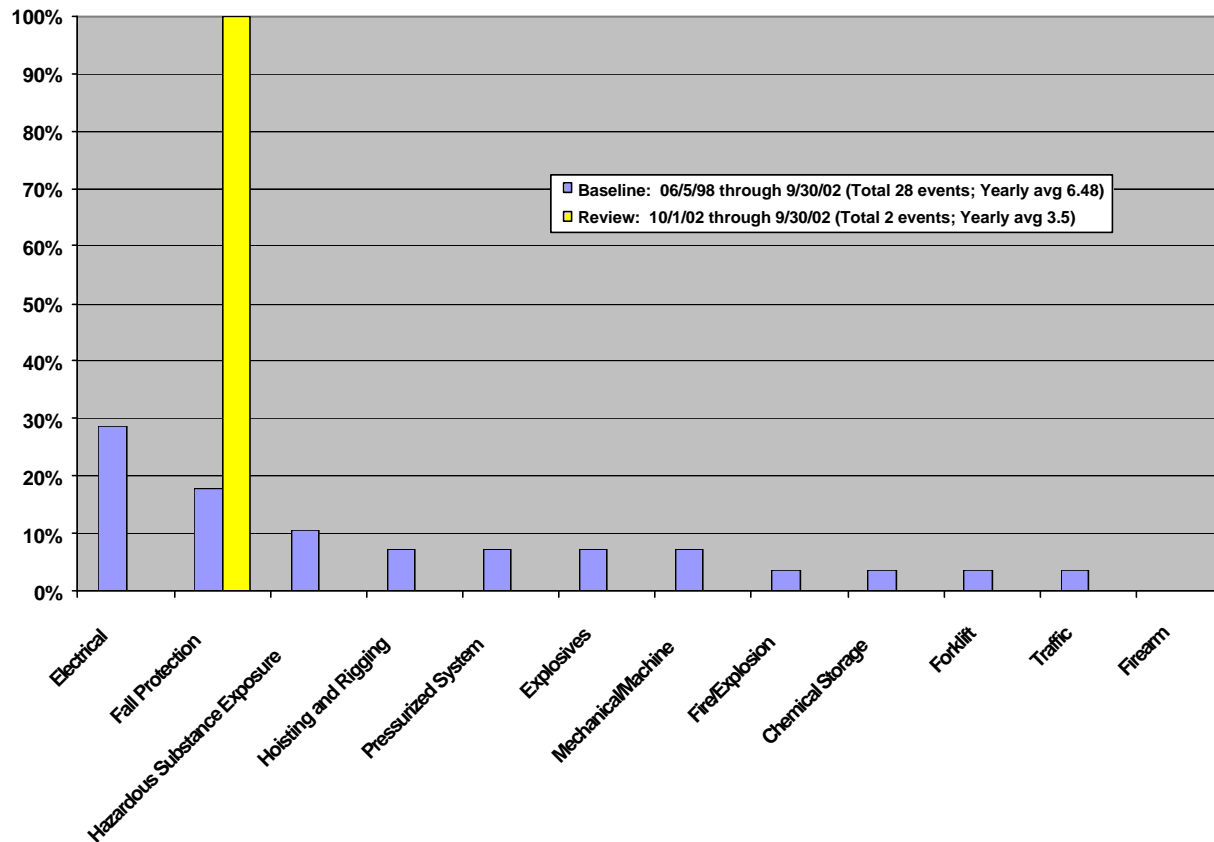*(6 month)*

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ESA Occurrence Performance
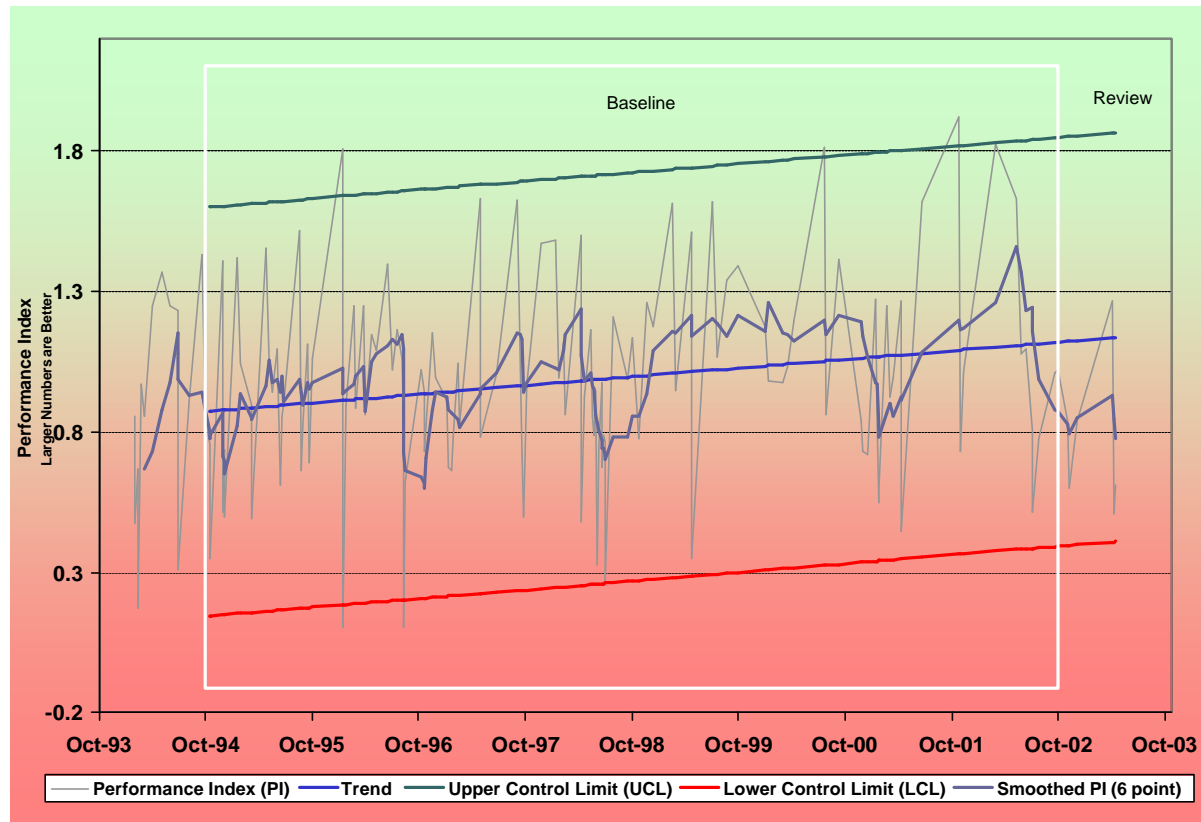
ESA PI Control Chart
(1/94 to 4/24/03)

- 149 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 16 events
  - Baseline: 126 events
  - Review: 7 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
🟥	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Type Distribution of ESA Occurrences

Occurrences by Type
Baseline vs. Review

- Personnel Safety decreases from 43% in baseline to 28% in review period

- Radiological Protection decreases from 22% to 14%

- Authorization Basis increases from 8% to 43% (3 events)

- Fire Protection increases from 5% to 15% (1 event)
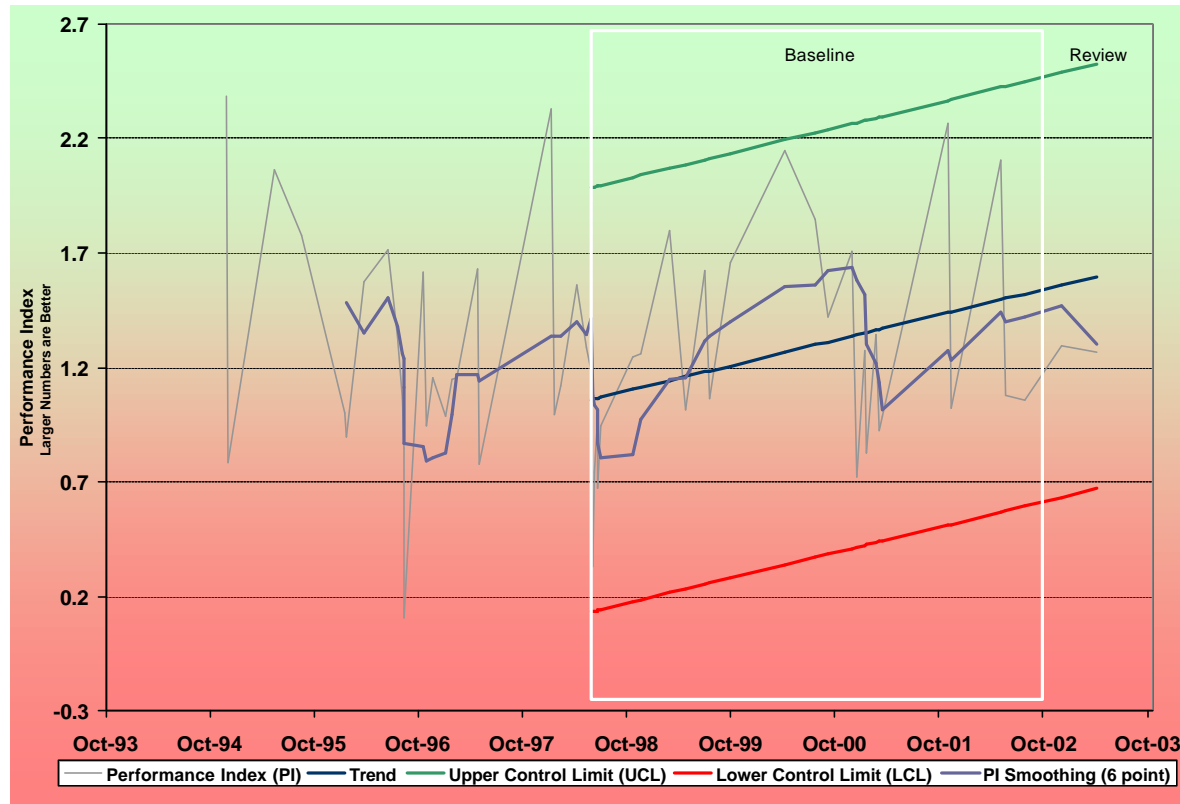
Legend:
- Baseline: 10/01/94 through 9/30/02 (Total 126 events; Yearly avg 15.75)
- Review: 10/01/02 through 4/24/03 (Total 7 events; Yearly avg 12.5)

Chart categories (x-axis): Personnel Safety, Radiological Protection, Environmental, Authorization Basis, Safety SSC Problem, Fire Protection, Packaging and Transportation, Property/Equipment Problem, Critical Equipment Failure

Y-axis: 0% to 45%

Los Alamos

ESA Personnel Safety Occurrence Performance

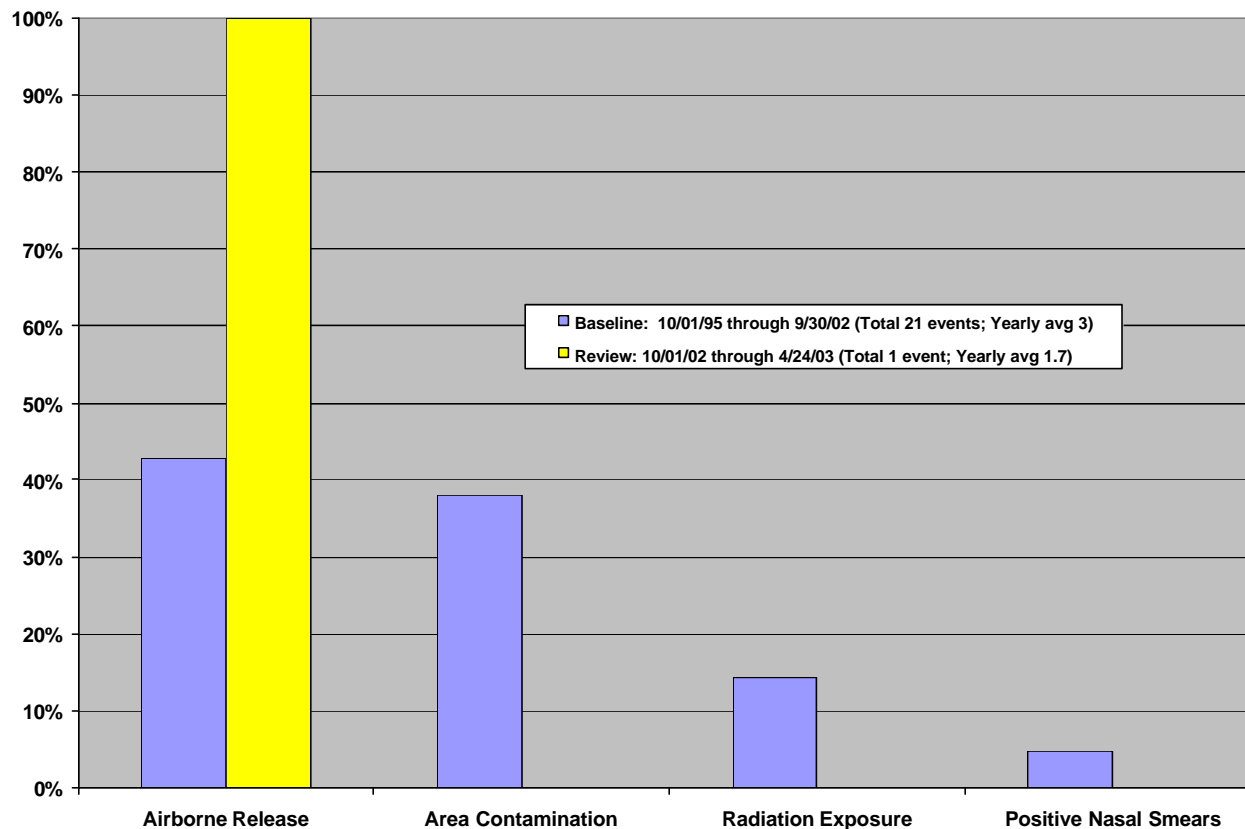Personnel Safety Control Chart
(1/94 to 4/24/03)

- 57 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 27 events
  - Baseline: 28 events
  - Review: 2 events

Review Period Score	
🟨	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟩	Annualized Rate
N/A	Control Limit
🟩	OVERALL SCORE

Types of ESA Personnel Safety Occurrences

Chart legend:
- Baseline: 06/5/98 through 9/30/02 (Total 28 events; Yearly avg 6.48)
- Review: 10/1/02 through 9/30/02 (Total 2 events; Yearly avg 3.5)

Chart categories (x-axis): Electrical, Fall Protection, Hazardous Substance Exposure, Hoisting and Rigging, Pressurized System, Explosives, Mechanical/Machine, Fire/Explosion, Chemical Storage, Forklift, Traffic, Firearm

ESA Personnel Safety Occurrences by Type
Baseline vs. Review

- Fall Protection increases from about 20% in baseline to 100% of review period (2 events)

- Drop-off in all other types of personnel safety events for review period

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ESA Radiological Protection Occurrence Performance

Radiological Protection Control Chart
(1/94 to 4/24/03)

- 35 total events severity weighted 2, 3, or 4
    - Pre-Baseline: 13 events
    - Baseline: 21 events
    - Review: 1 event

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

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Types of ESA Radiological Protection Occurrences

Chart legend:
- ■ Baseline: 10/01/95 through 9/30/02 (Total 21 events; Yearly avg 3)
- □ Review: 10/01/02 through 4/24/03 (Total 1 event; Yearly avg 1.7)

X-axis categories: Airborne Release, Area Contamination, Radiation Exposure, Positive Nasal Smears
Y-axis: 0% to 100%

ESA Radiological Protection Occurrences by Type
Baseline vs. Review

• Airborne Release increases from 43% of baseline to 100% of review period (1 event)

• Drop-off in other types of radiological protection incidents

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ESA Authorization Basis Occurrence Performance

Authorization Basis Control Chart
(1/94 to 4/24/03)

- 16 total events severity weighted 2 or 3
  - Baseline: 13 events
  - Review: 3 events
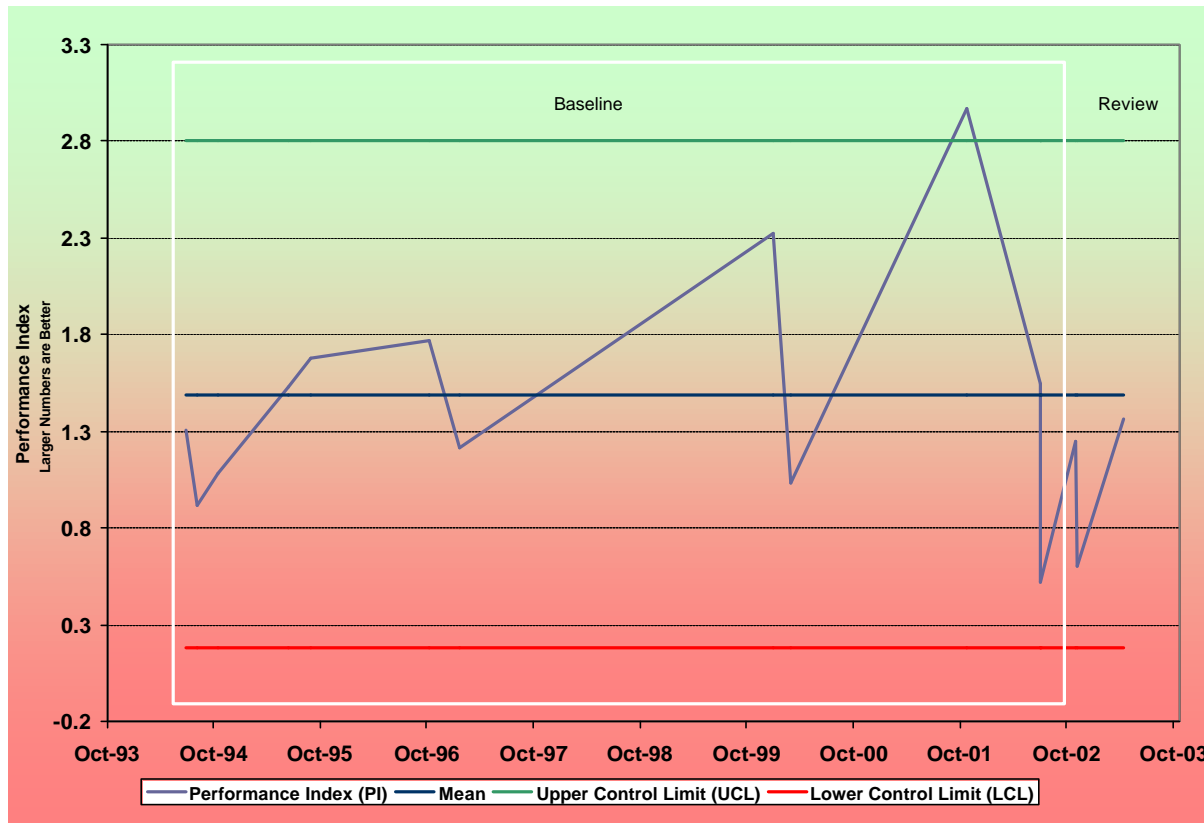
Review Period Score	
Sustained Performance	
Review Period Trend	N/A
Over/Under Trend	N/A
Annualized Rate	
Control Limit	N/A
OVERALL SCORE	

Types of ESA Authorization Basis Occurrences

Chart legend:
- Baseline: 01/01/94 to 9/30/02 (Total 13 events; Yearly avg 1.48)
- Review: 10/01/02 to 4/24/03 (Total 3 events; Yearly avg 5.3)

X-axis categories: TSR/OSR Violation, Positive USQ, AB Compliance, Unauthorized Work

Y-axis: 0% to 70%
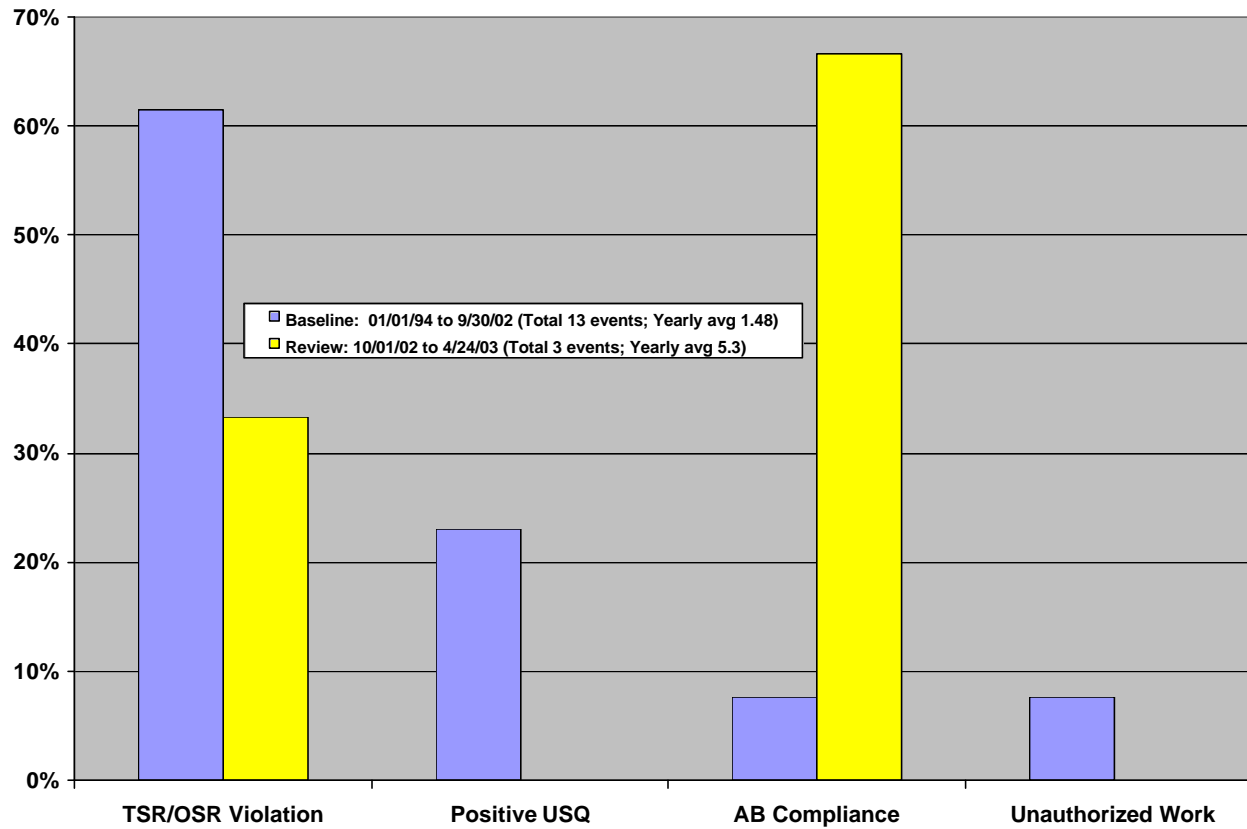
ESA Authorization Basis Occurrences by Type
Baseline vs. Review

• Decrease of TSR/OSR Violations from 62% in baseline to 33% in review period (1 event)

• Increase of AB Compliance issues from 8% to 67% in review period (2 events)

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Direct Causes of ESA Authorization Basis Occurrences

CAUSE GROUPS
- Personnel Error
- Equipment
- Management Problem
- External

Chart categories (x-axis): Procedural Violation, Inattention to Detail, Communication Error, Equipment/Material Problem, Inadequate Procedure/Policy, Planning Problem, External Problem
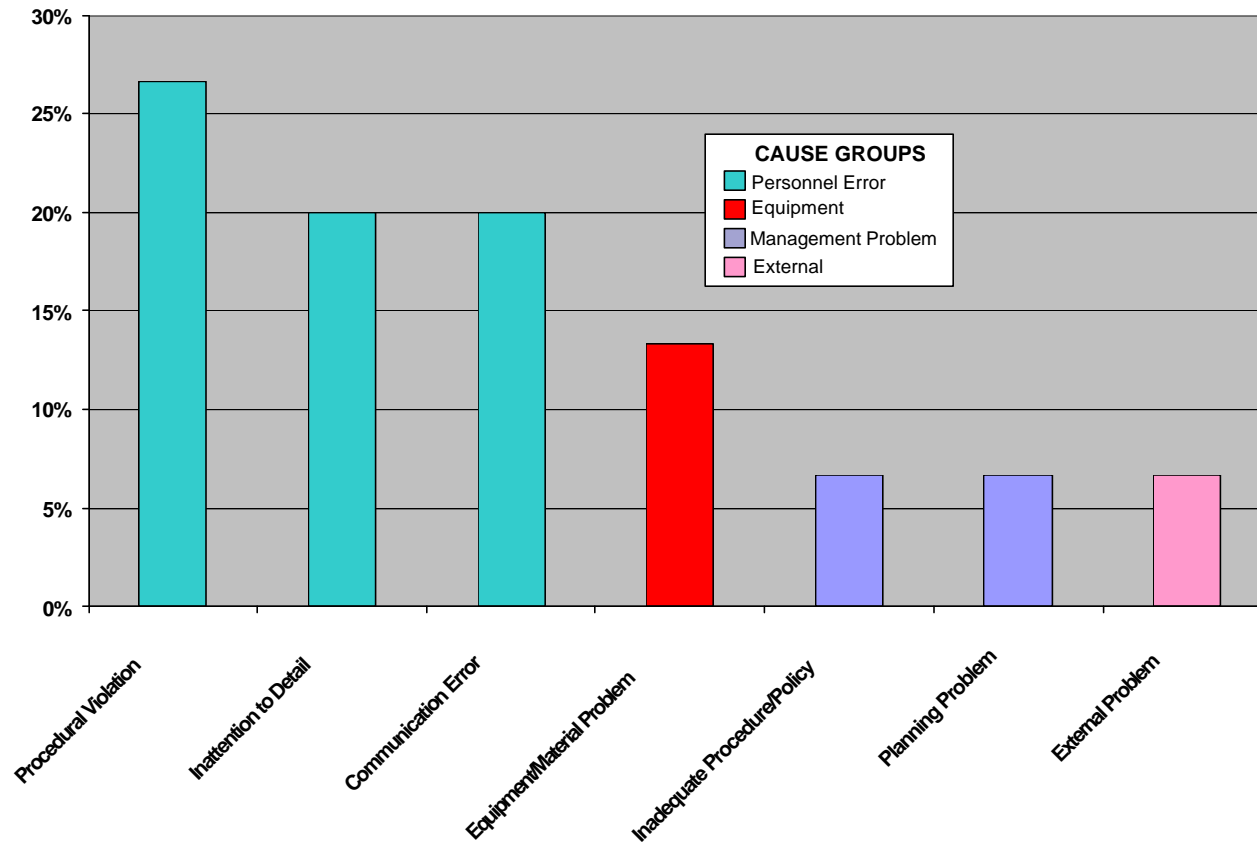
Direct Causes
Baseline and Review

• Personnel Error predominant direct cause for both baseline and review periods—nearly 70% of total

• Equipment Material Problem and Management Problem each identified as direct cause in 12% of events

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Root Causes of ESA Authorization Basis Occurrences
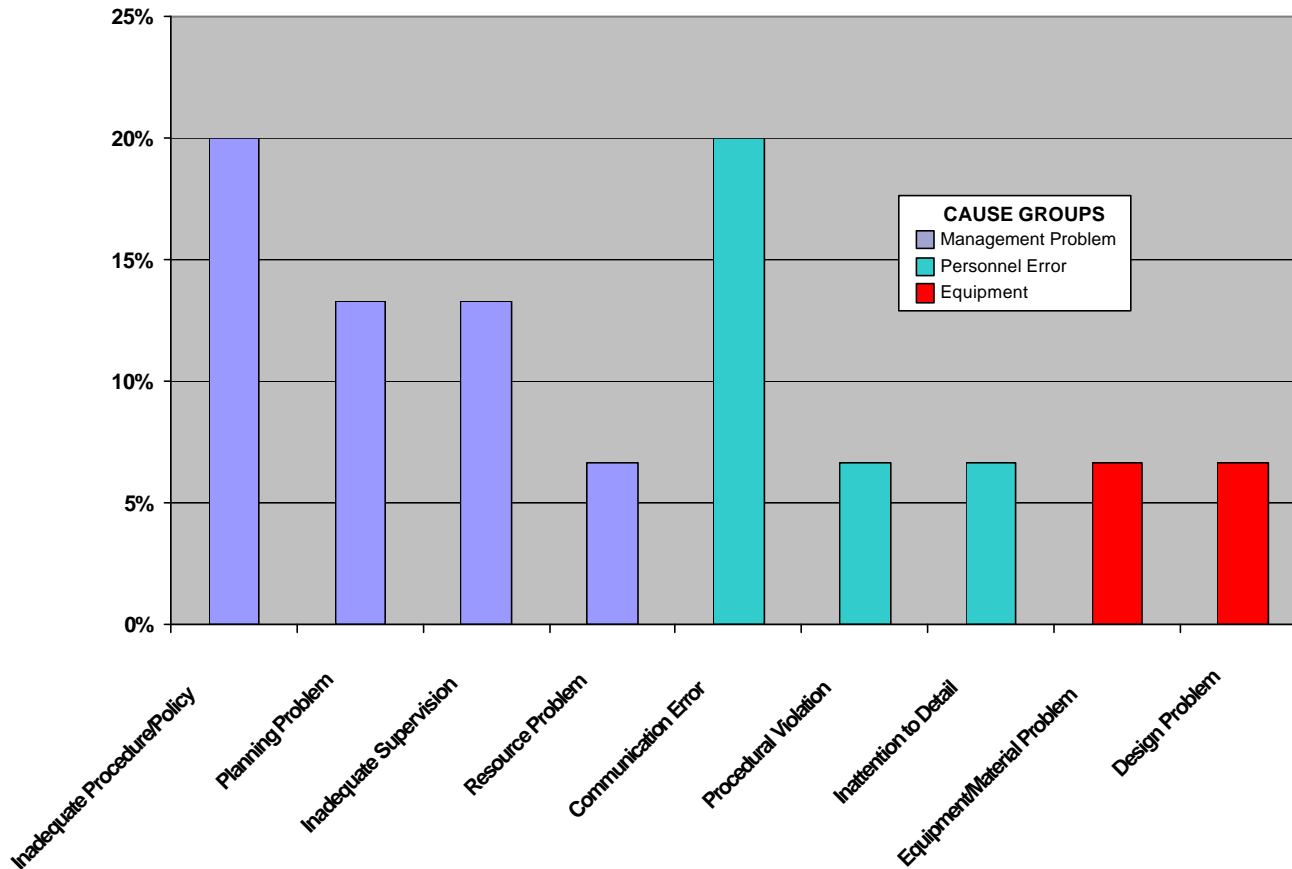
Root Causes
Baseline and Review

- Management Problem predominant root cause for baseline and review periods–53% of total
- Personnel Error identified as root cause in 33% of authorization basis events
- Equipment Problem identified in 14% of events

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Profile of ESA Corrective Actions for Authorization Basis
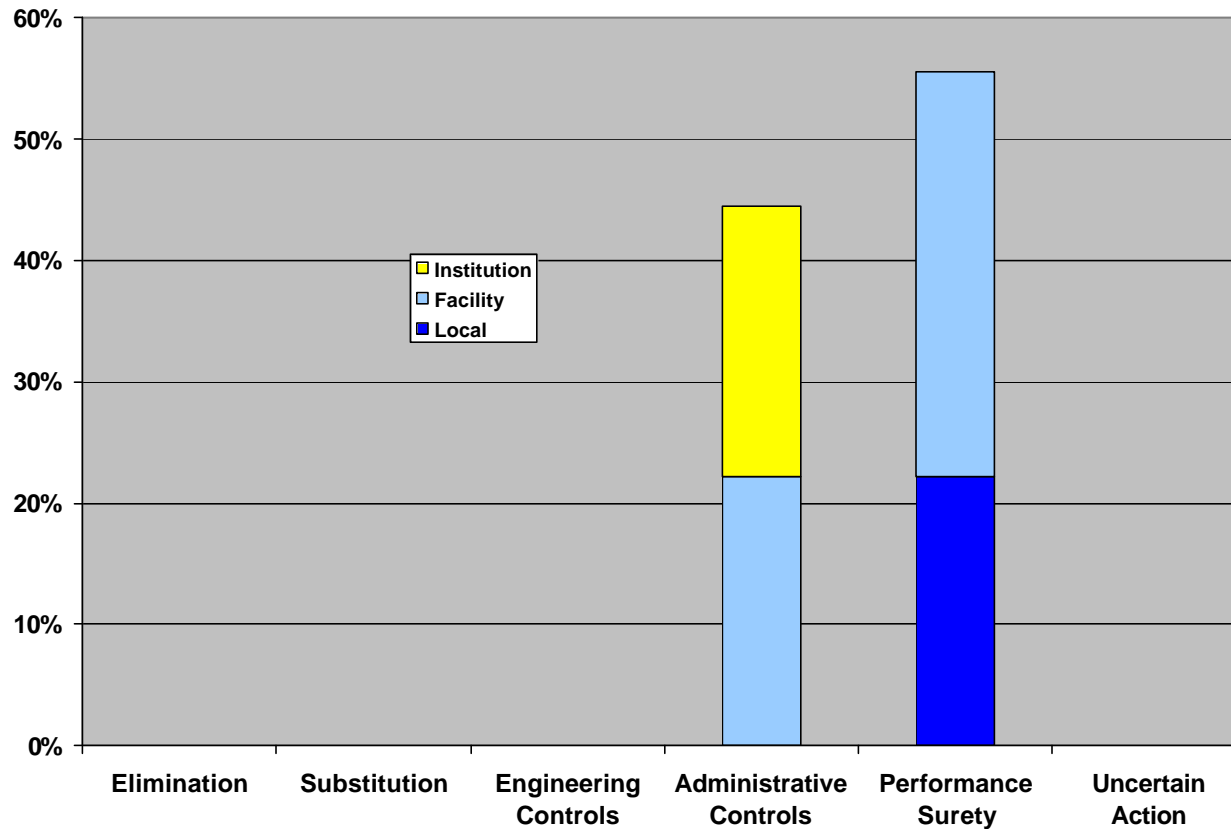
Corrective Actions
(10/01/99 to 4/24/03)

• No actions target eliminating or substituting for lesser hazard or modifying engineered barriers
• 44% of all actions involve developing new procedures or modifying existing procedures
• 56% of all actions target "performance surety"— driven by direct and root causal patterns of personnel errors and inadequate procedures or policies

Legend:
- ☐ Institution
- ☐ Facility
- ■ Local

Chart categories (x-axis): Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

Chart y-axis: 0% to 60%

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ESA Performance Surety Actions for Authorization Basis Events
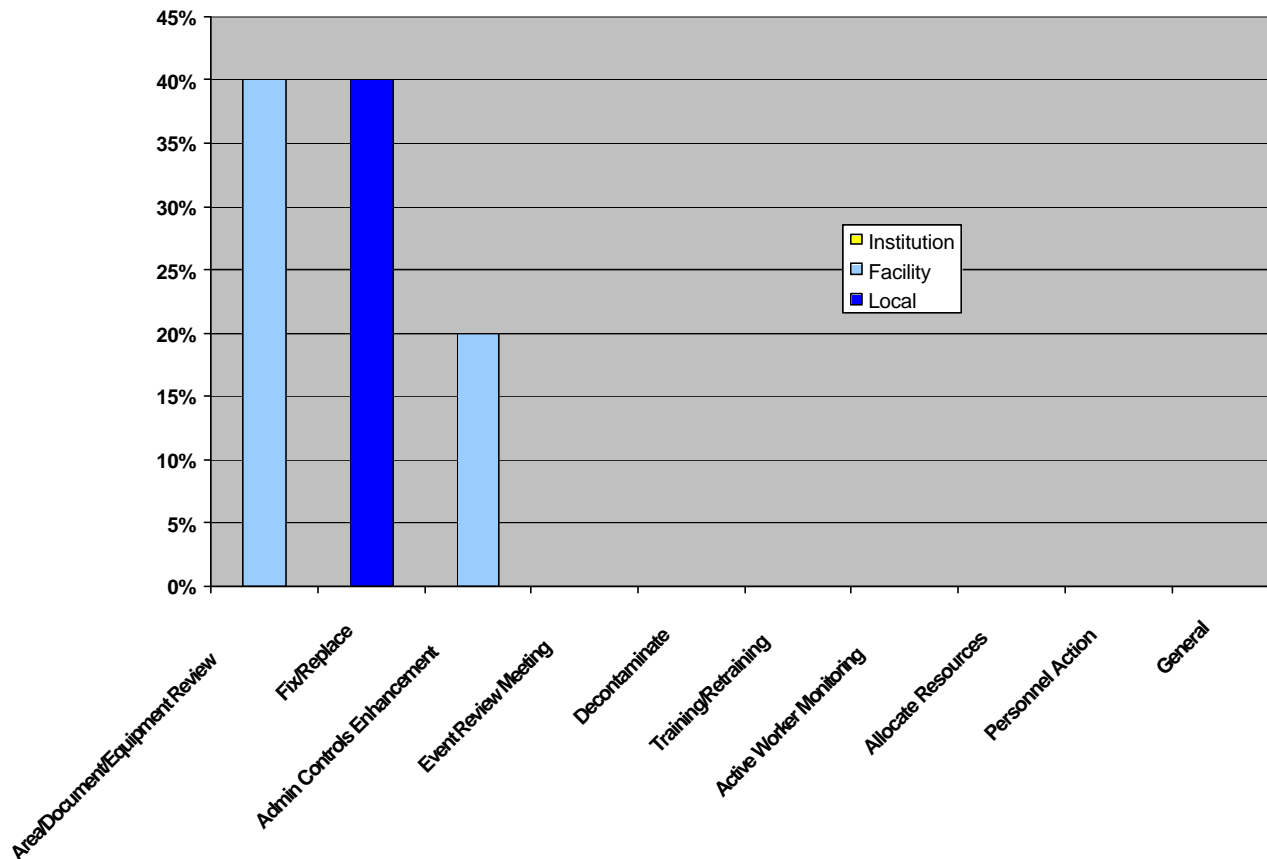
Performance Surety Actions
(10/01/99 to 4/24/03)

• 40% of actions involve area, document, or equipment reviews
• 40% of actions involve repair or replacement of equipment or material
• 20% involve enhancements to existing administrative controls (i.e., increasing frequency of monitoring)
• No actions involve active monitoring of worker performance/ procedural compliance

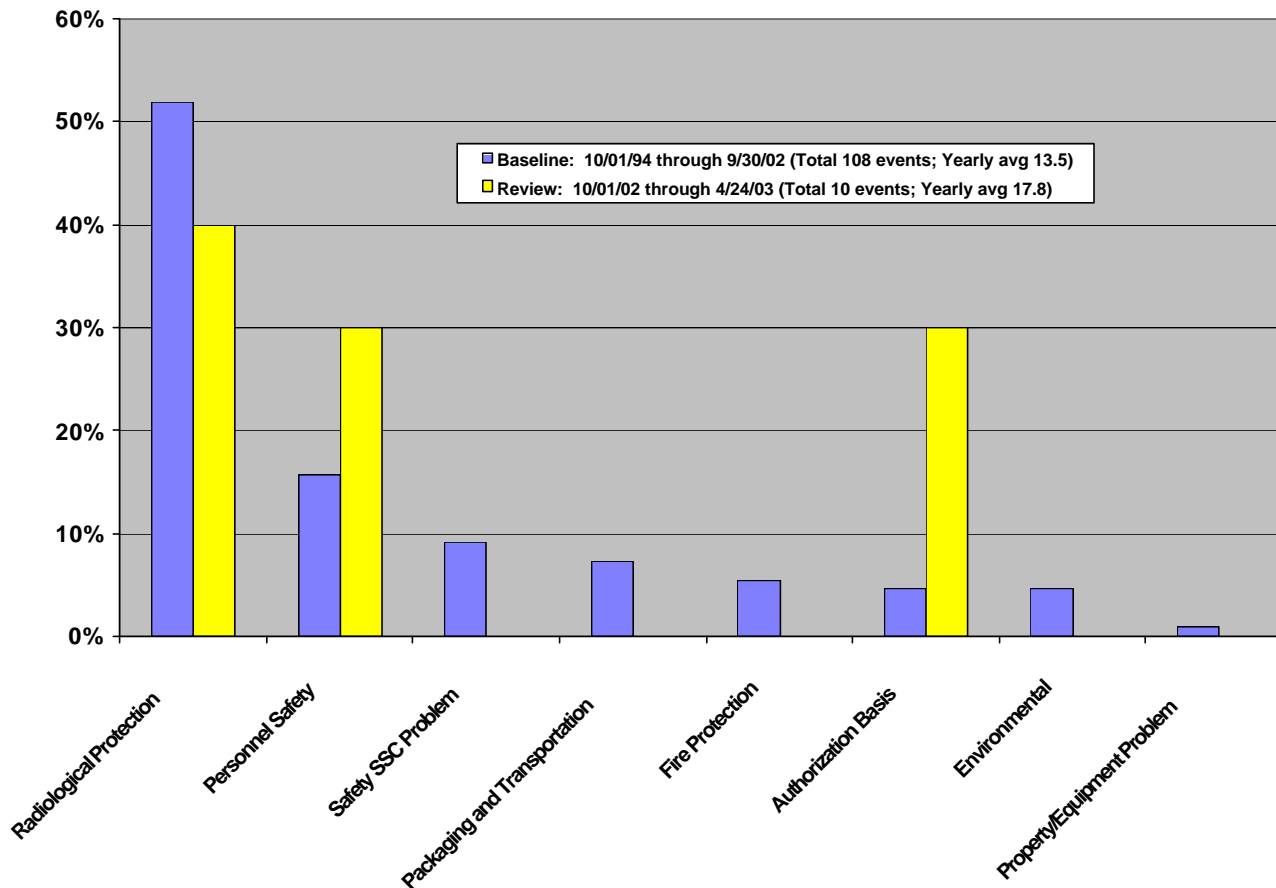Los Alamos

ESA Environmental Occurrence Performance
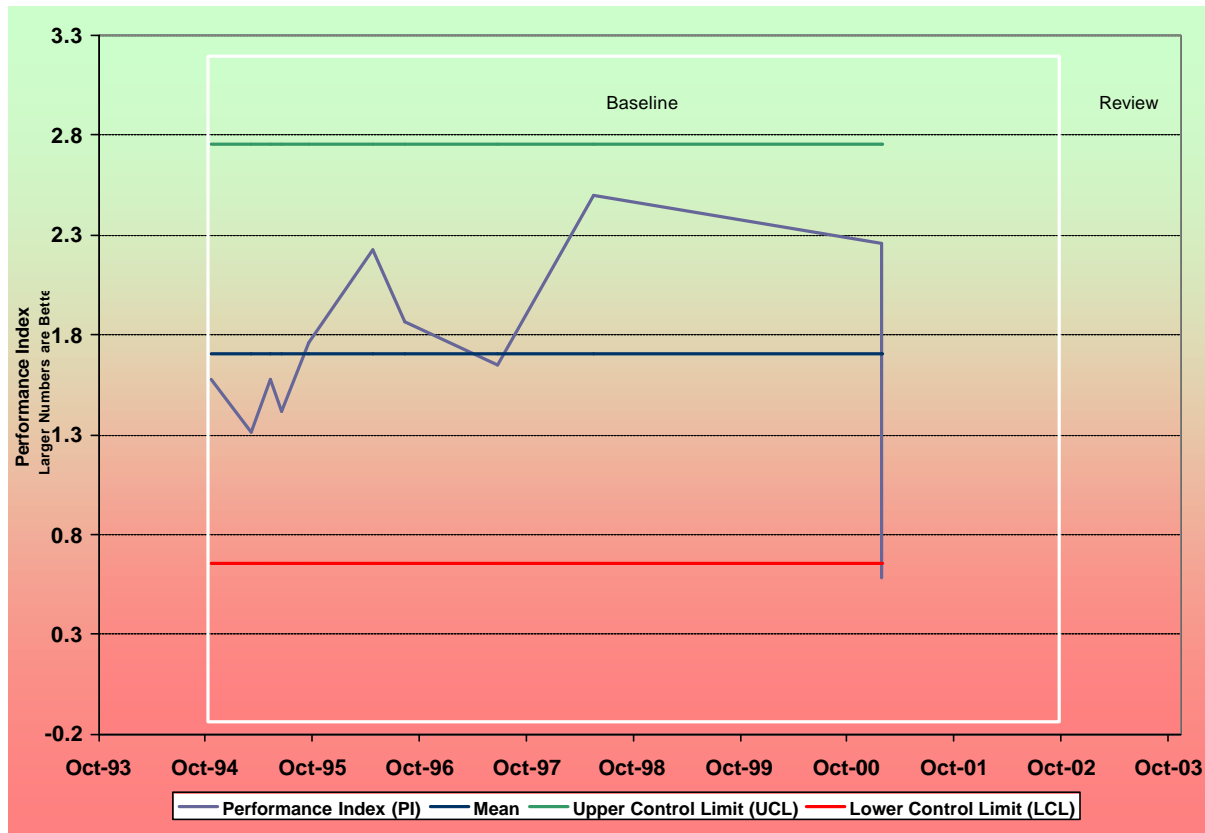
Environmental Control Chart
(1/94 to 4/24/03)

- 12 total events severity weighted 2 or 3
  - Baseline: 12 events
  - Review: 0 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

C Division Occurrences

FY2003
(6 month)

Los Alamos

C Occurrence Performance
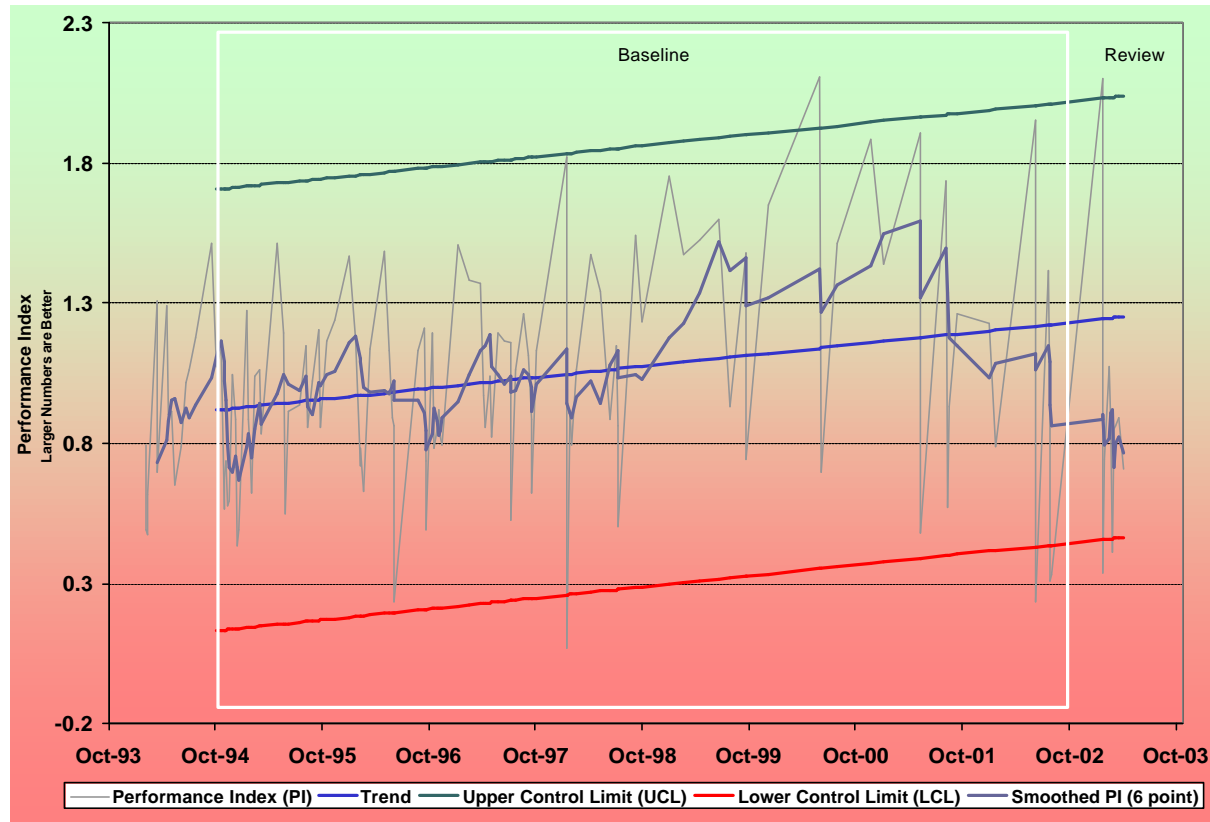
C PI Control Chart
(1/94 to 4/24/03)

- 134 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 16 events
  - Baseline: 108 events
  - Review: 10 events

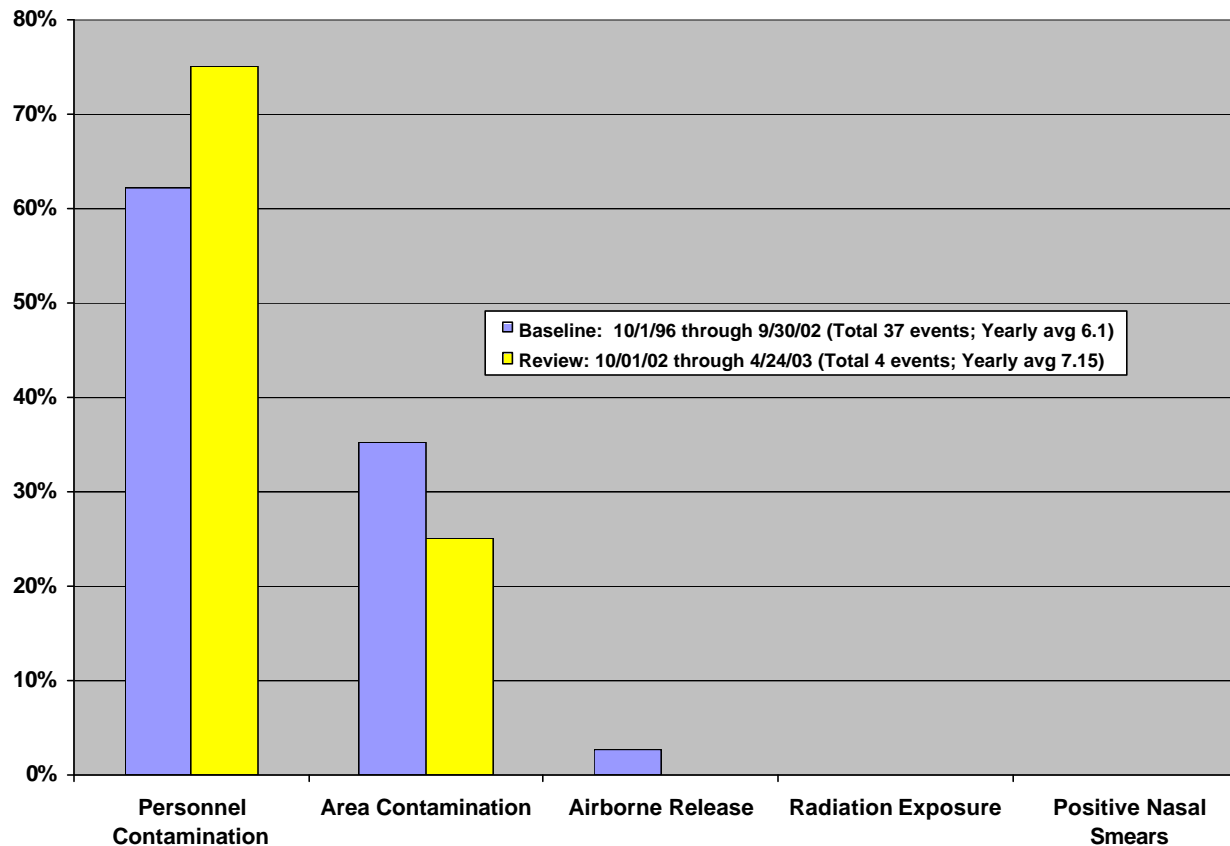| Review Period Score	
▢	Sustained Performance
▢	Review Period Trend
▢	Over/Under Trend
▢	Annualized Rate
▢	Control Limit
▢	**OVERALL SCORE**

Chart legend: Performance Index (PI) — Trend — Upper Control Limit (UCL) — Lower Control Limit (LCL) — Smoothed PI (6 point)

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Type Distribution of C Occurrences

Occurrences by Type
Baseline vs. Review

Legend:
- Baseline: 10/01/94 through 9/30/02 (Total 108 events; Yearly avg 13.5)
- Review: 10/01/02 through 4/24/03 (Total 10 events; Yearly avg 17.8)

Categories (x-axis): Radiological Protection, Personnel Safety, Safety SSC Problem, Packaging and Transportation, Fire Protection, Authorization Basis, Environmental, Property/Equipment Problem

• Radiological Protection predominant type in both baseline and review periods—52% and 40% respectively

• Increase of Personnel Safety from 16% of baseline to 30% of review period

• Increase of Authorization Basis from 5% of baseline to 30% of review period
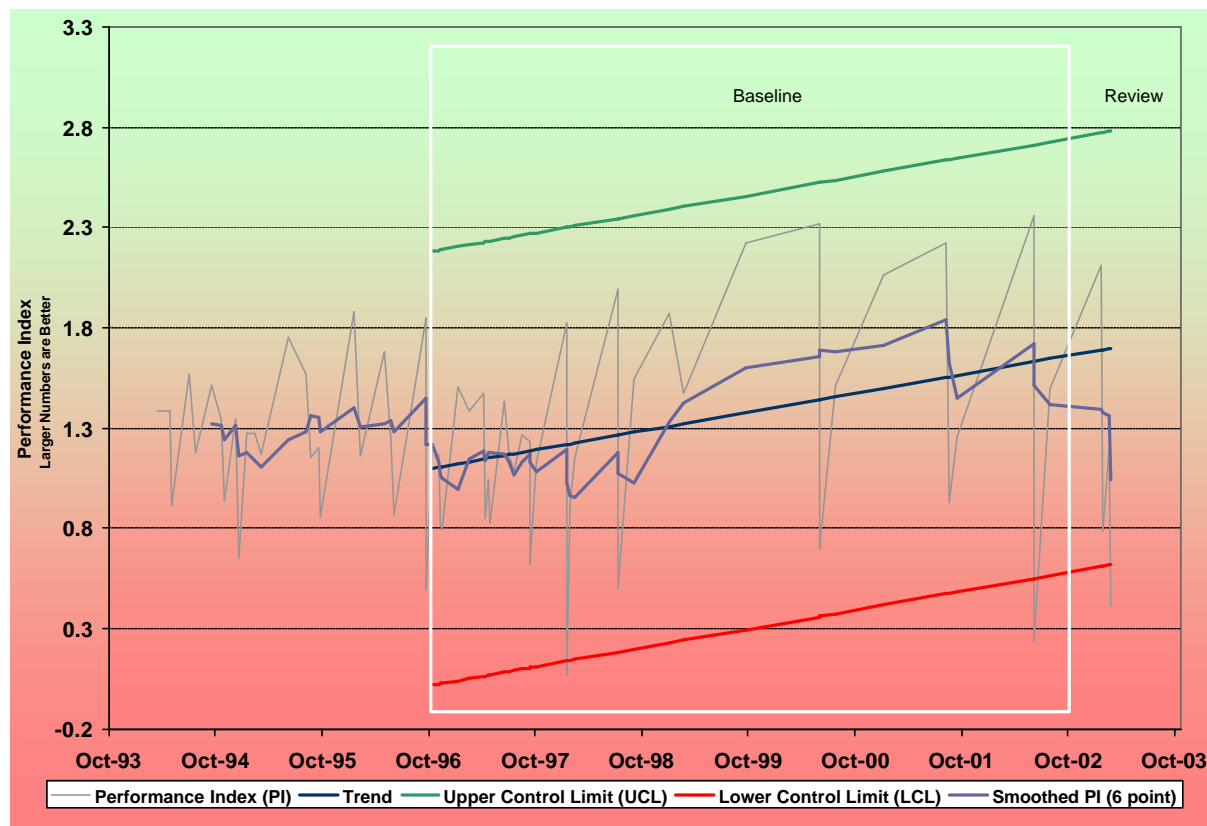
Los Alamos

C Radiological Protection Occurrence Performance

Radiological Protection Control Chart
(1/94 to 4/24/03)

- 67 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 26 events
  - Baseline: 37 events
  - Review: 4 events

Review Period Score	
⬜ (yellow)	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟥 (red)	Annualized Rate
🟥 (red)	Control Limit
🟥 (red)	OVERALL SCORE

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Types of C Radiological Protection Occurrences

C Radiological Protection Occurrences by Type
Baseline vs. Review

Chart legend:
- Baseline: 10/1/96 through 9/30/02 (Total 37 events; Yearly avg 6.1)
- Review: 10/01/02 through 4/24/03 (Total 4 events; Yearly avg 7.15)

Chart categories: Personnel Contamination, Area Contamination, Airborne Release, Radiation Exposure, Positive Nasal Smears

- Personnel contamination predominant type for baseline and review—62% and 75% respectively

- Area contamination decreases from 35% of baseline to 25% of review

- Drop-off in Airborne Release occurrences

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Direct Causes of C Radiological Protection Occurrences
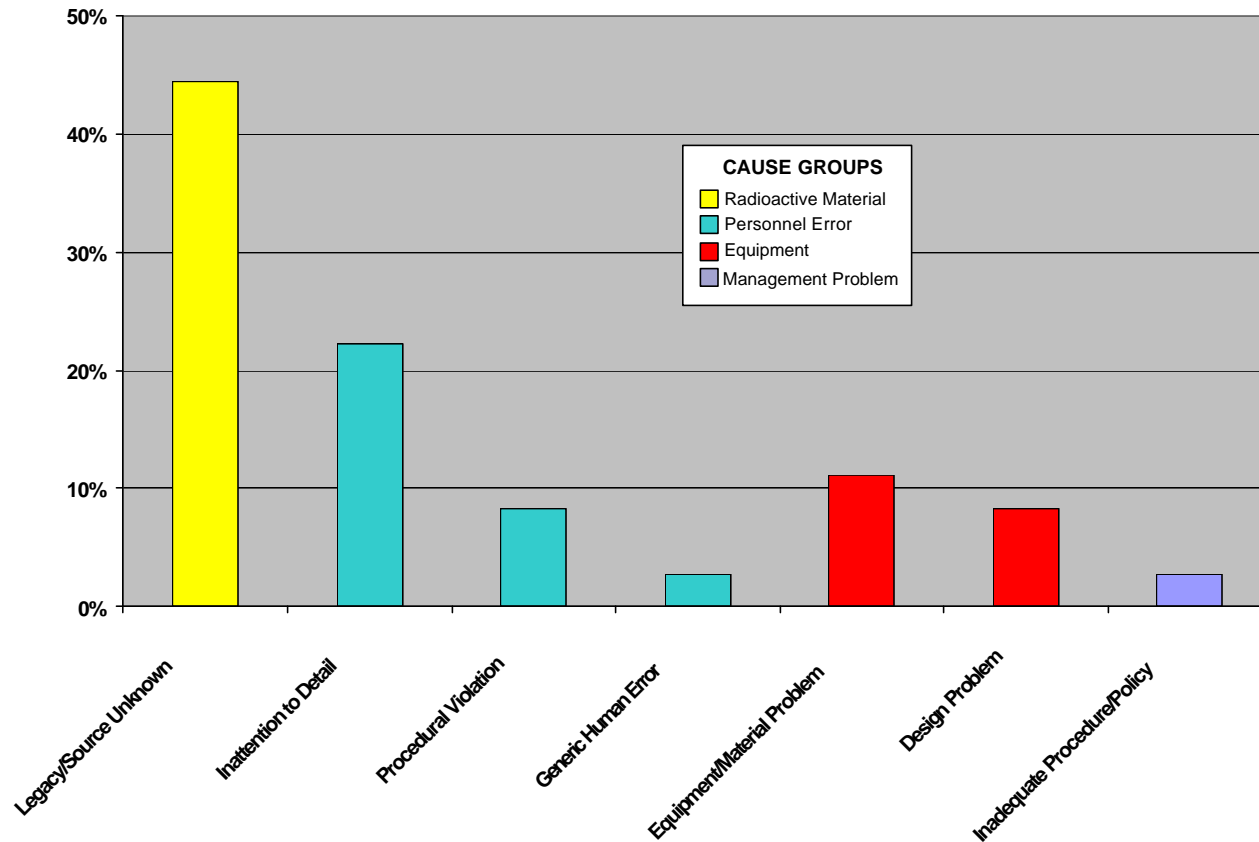
CAUSE GROUPS
- Radioactive Material
- Personnel Error
- Equipment
- Management Problem

Chart categories (x-axis): Legacy/Source Unknown, Inattention to Detail, Procedural Violation, Generic Human Error, Equipment/Material Problem, Design Problem, Inadequate Procedure/Policy

Direct Causes
Baseline and Review

• Legacy Contamination or Unknown Source predominant direct cause for baseline and review periods—44% of total
• Personnel Error identified as direct cause in 33% of radiological events

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Root Causes of C Radiological Protection Occurrences
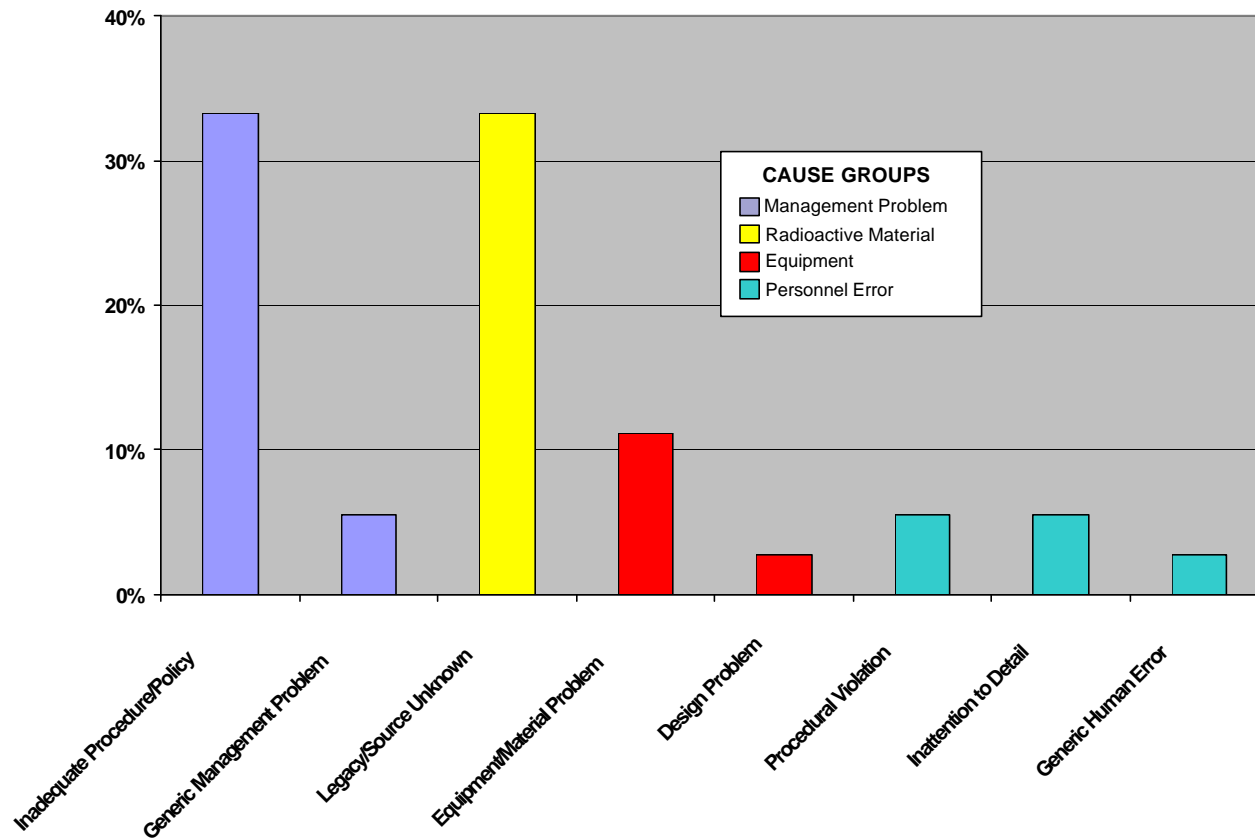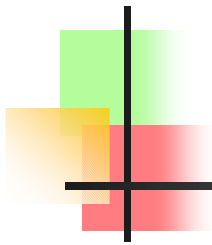
Root Causes
Baseline and Review

• Management Problem predominant root cause for baseline and review periods—about 40% of total

• Legacy Contamination or Unknown Source identified as root cause in 33% of events

• Equipment Problem and Personnel Error each identified in about 14% of events

Profile of C Corrective Actions for Radiological Protection
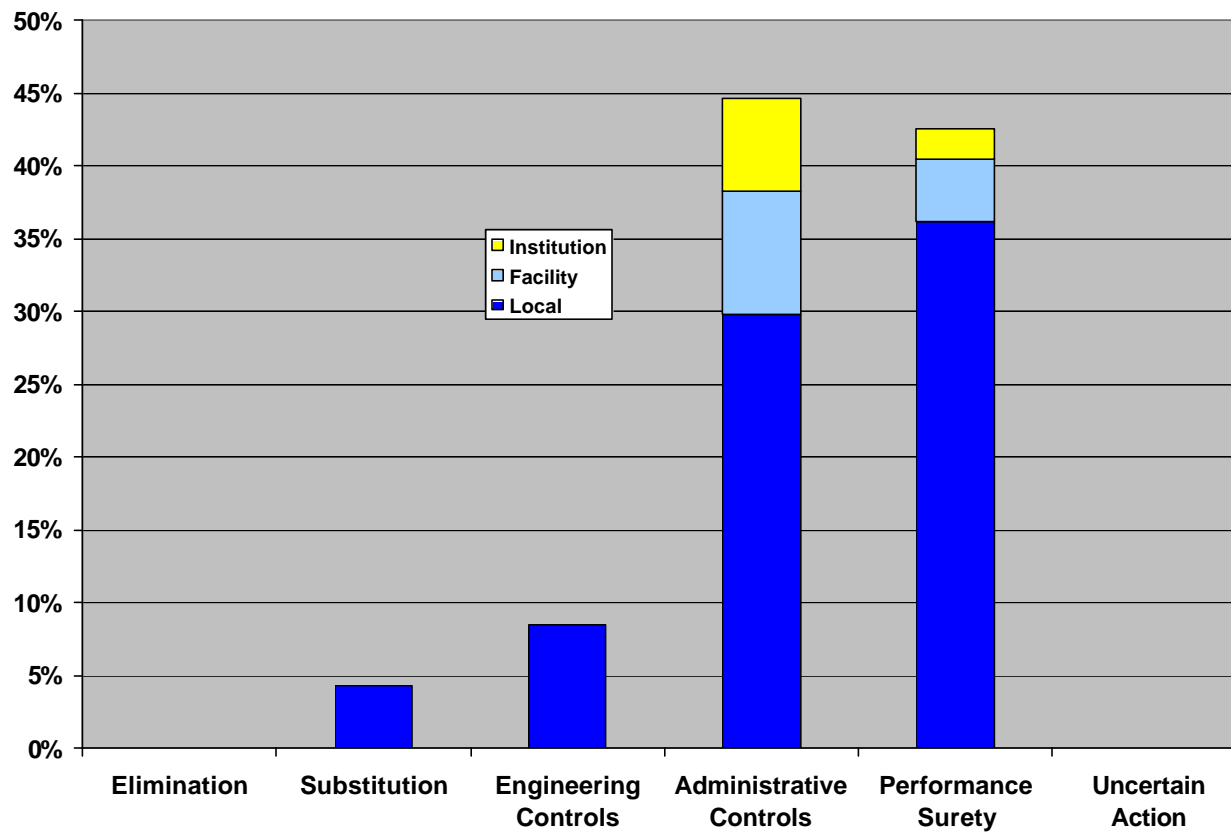
Corrective Actions
(10/01/97 to 4/24/03)

- 4% of all actions target eliminating or substituting for lesser hazard
- 9% of all actions involve modifying engineered barriers
- 44% of all actions involve developing new procedures or modifying existing procedures
- 43% of all actions target "performance surety" actions

C Performance Surety Actions for Radiological Protection
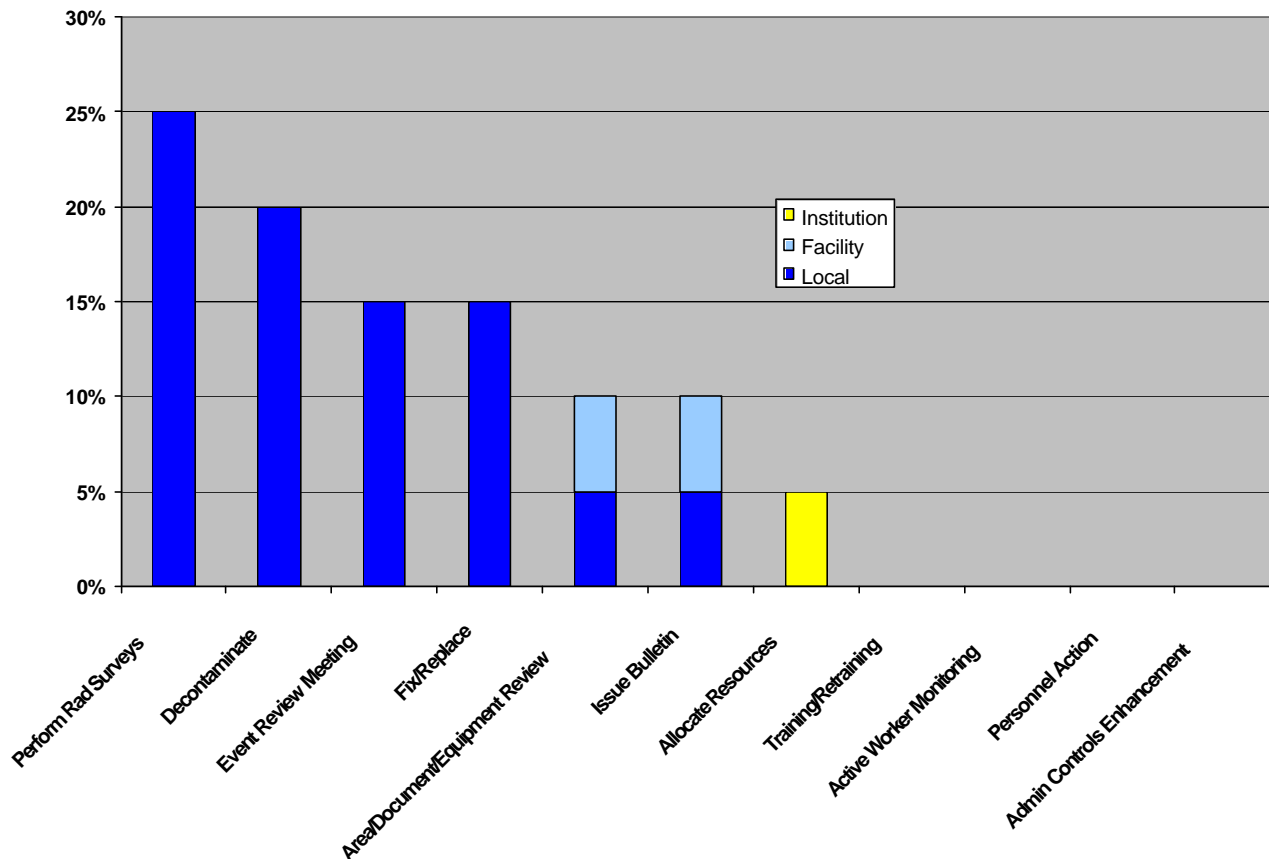
Performance Surety Actions
(10/01/00 to 4/24/03)

• 45% of all actions involve decontamination or radiation survey activities
• 25% of actions involve event review meetings or area, document, or equipment reviews
• No actions involve active monitoring of worker performance/ procedural compliance

Legend:
- Institution
- Facility
- Local

X-axis categories: Perform Rad Surveys, Decontaminate, Event Review Meeting, Fix/Replace, Area/Document/Equipment Review, Issue Bulletin, Allocate Resources, Training/Retraining, Active Worker Monitoring, Personnel Action, Admin Controls Enhancement

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C Personnel Safety Occurrence Performance
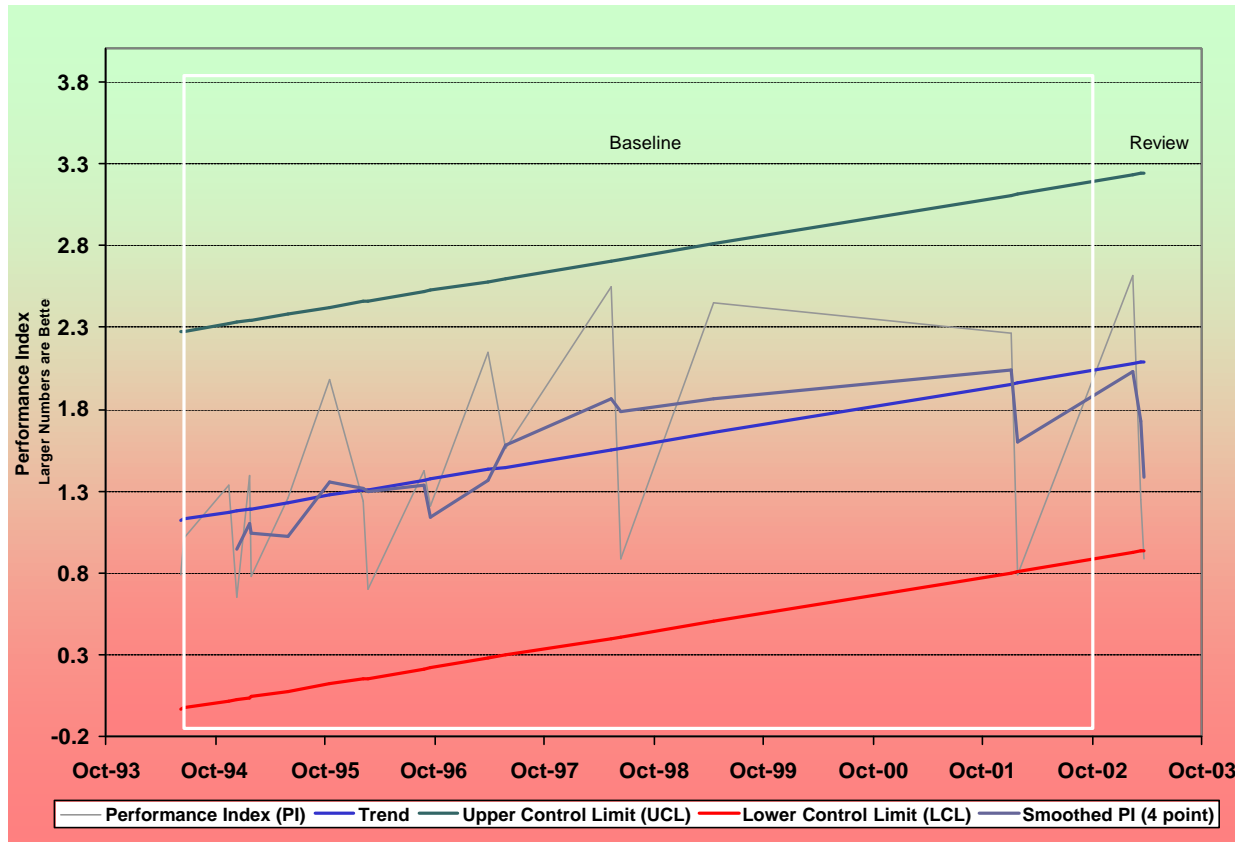
Personnel Safety Control Chart
(1/94 to 4/24/03)

- 23 total events severity weighted 2, 3, or 4
  - Baseline: 20 events
  - Review: 3 events

Review Period Score	
	Sustained Performance
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
	Annualized Rate
	Control Limit
	OVERALL SCORE

Types of C Personnel Safety Occurrences
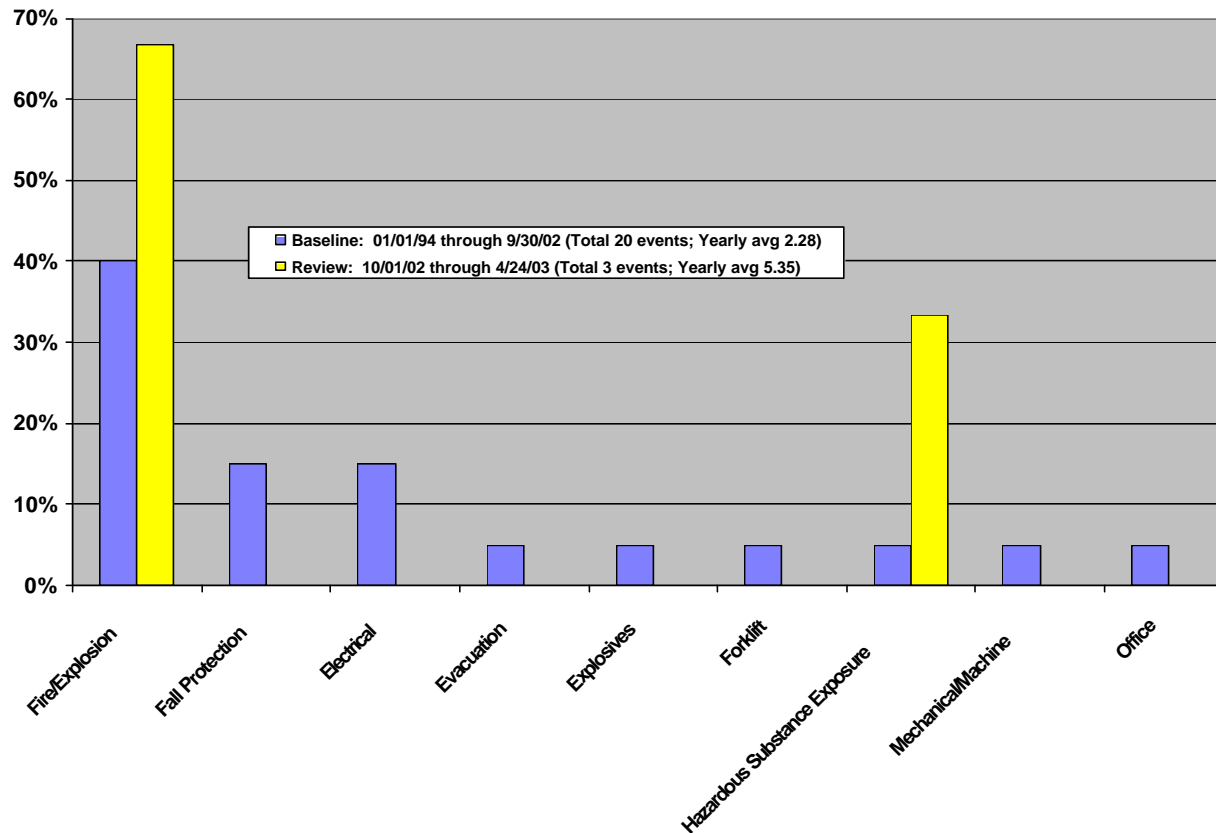
C Personnel Safety Occurrences by Type
Baseline vs. Review

- Fire/Explosion predominant type for both baseline and review—40% and 67% respectively

- Increase in percentage of Hazardous Substance Exposure in review period (1 event)

- Absence of other types of personnel safety events for review period

Chart legend:
- Baseline: 01/01/94 through 9/30/02 (Total 20 events; Yearly avg 2.28)
- Review: 10/01/02 through 4/24/03 (Total 3 events; Yearly avg 5.35)

X-axis categories: Fire/Explosion, Fall Protection, Electrical, Evacuation, Explosives, Forklift, Hazardous Substance Exposure, Mechanical/Machine, Office

- Los Alamos

Direct Causes of C Selected Personnel Safety Occurrences
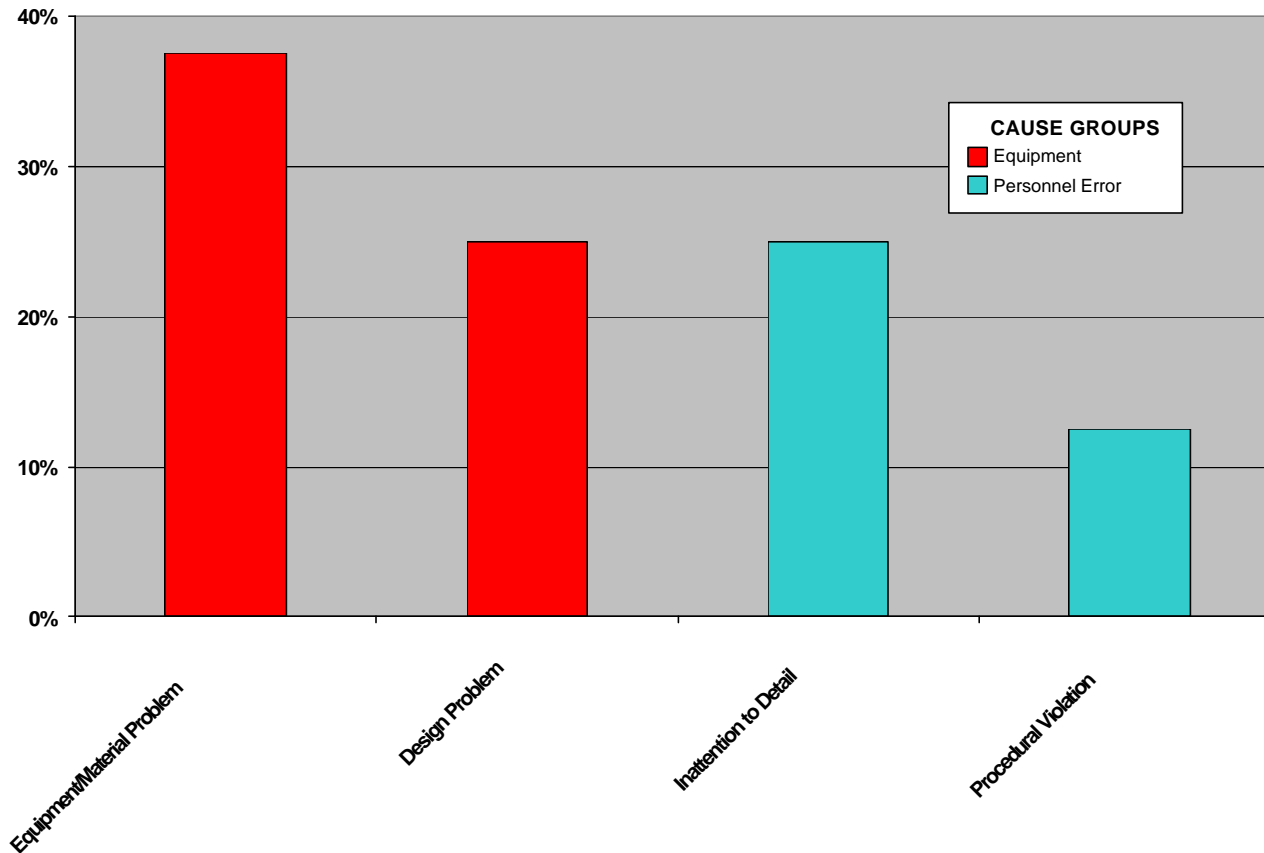
Direct Causes of Fire/Explosion Occurrences
Baseline and Review

• Principal direct cause is Equipment Problem—63% of total fire/explosion events
• Personnel Error identified as direct cause in 37% of events

Root Causes of C Selected Personnel Safety Occurrences
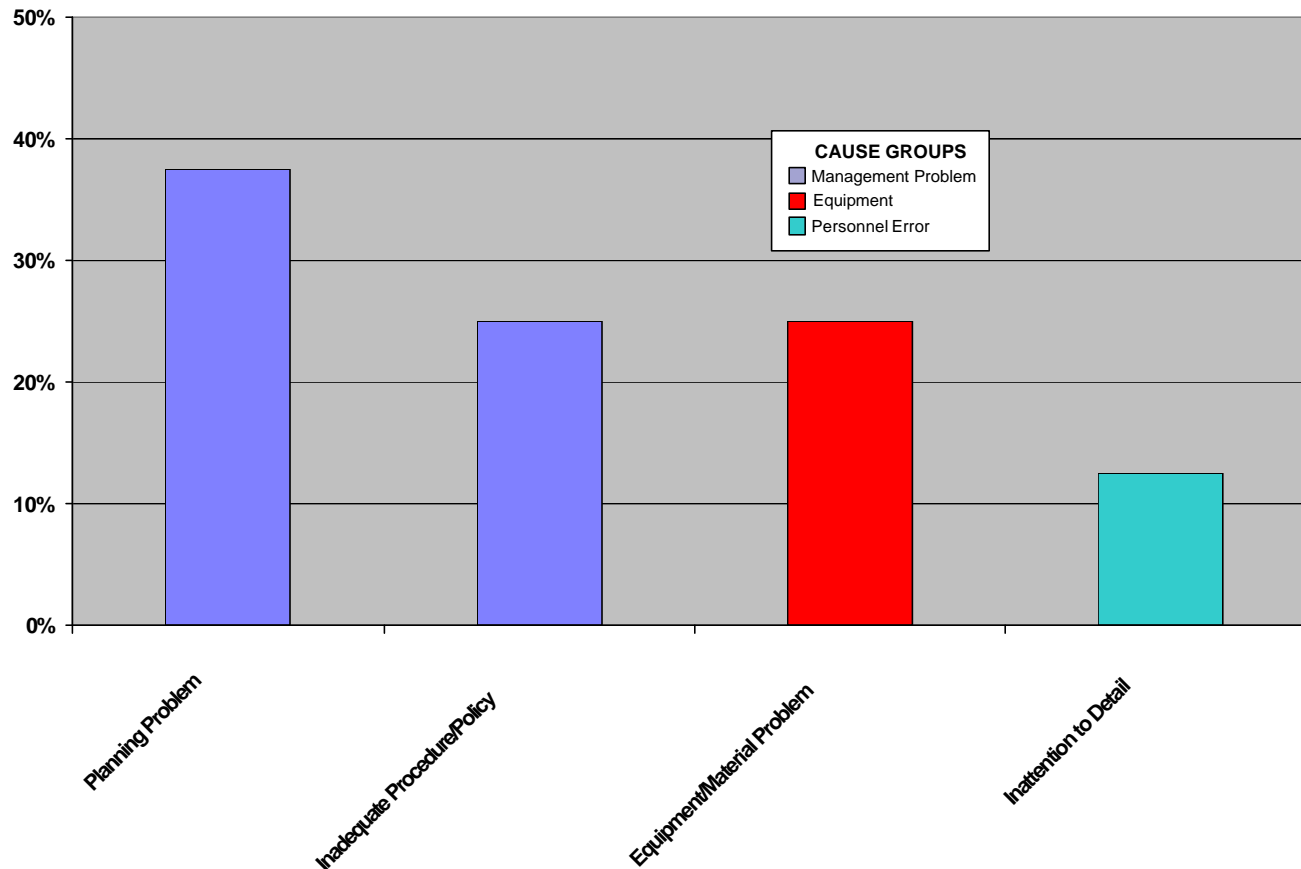
Root Causes of Fire/Explosion Occurrences
Baseline and Review

• Management Problem is principal root cause in baseline and review period—63% of total fire/explosion events
• Equipment Problem accounts for 25% of total events

CAUSE GROUPS
- Management Problem
- Equipment
- Personnel Error

Planning Problem
Inadequate Procedure/Policy
Equipment/Material Problem
Inattention to Detail

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Profile of C Corrective Actions for Personnel Safety Events
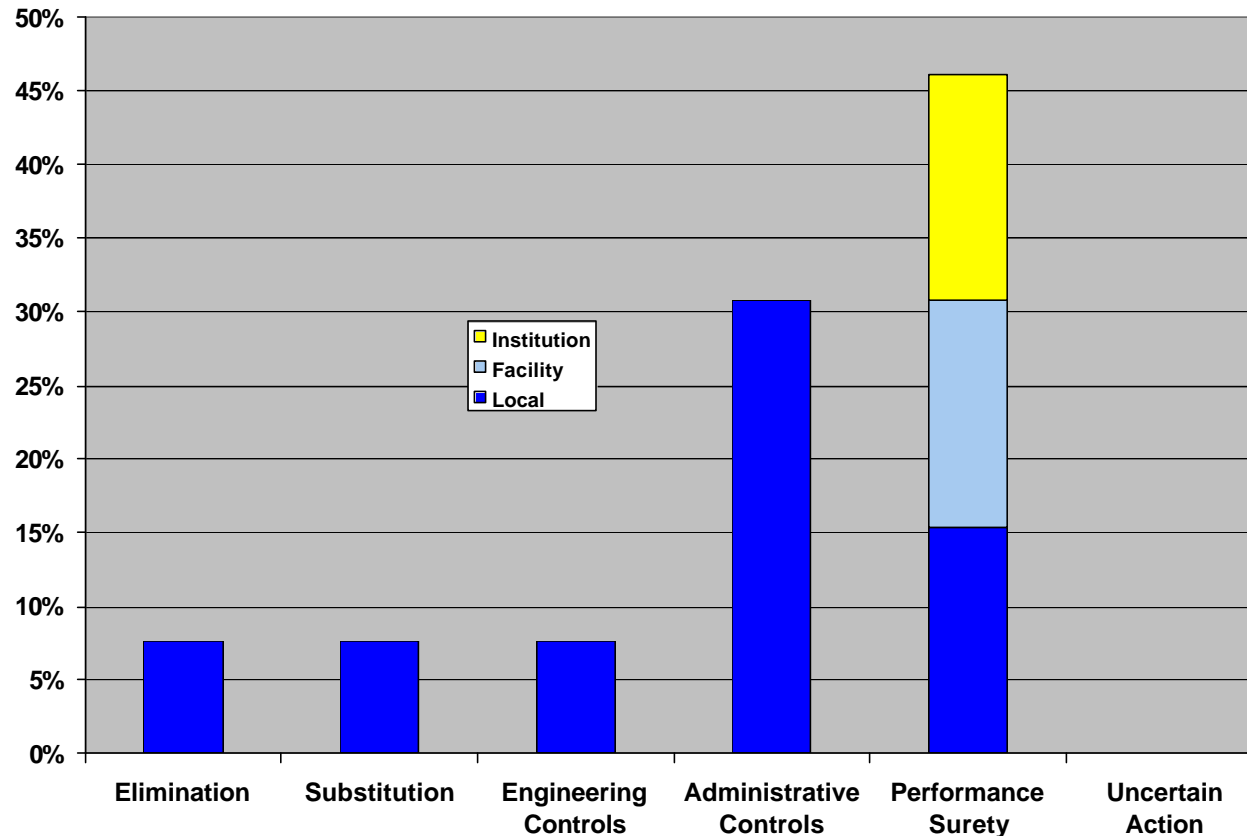
Corrective Actions for Personnel Safety Occurrences
(10/01/97 to 4/24/03)

• About 16% of actions target eliminating or substituting for lesser hazard
• About 8% specify new or modified engineering barriers
• About 76% of all actions target procedural changes or "performance surety"

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C Performance Surety Actions for Personnel Safety Events
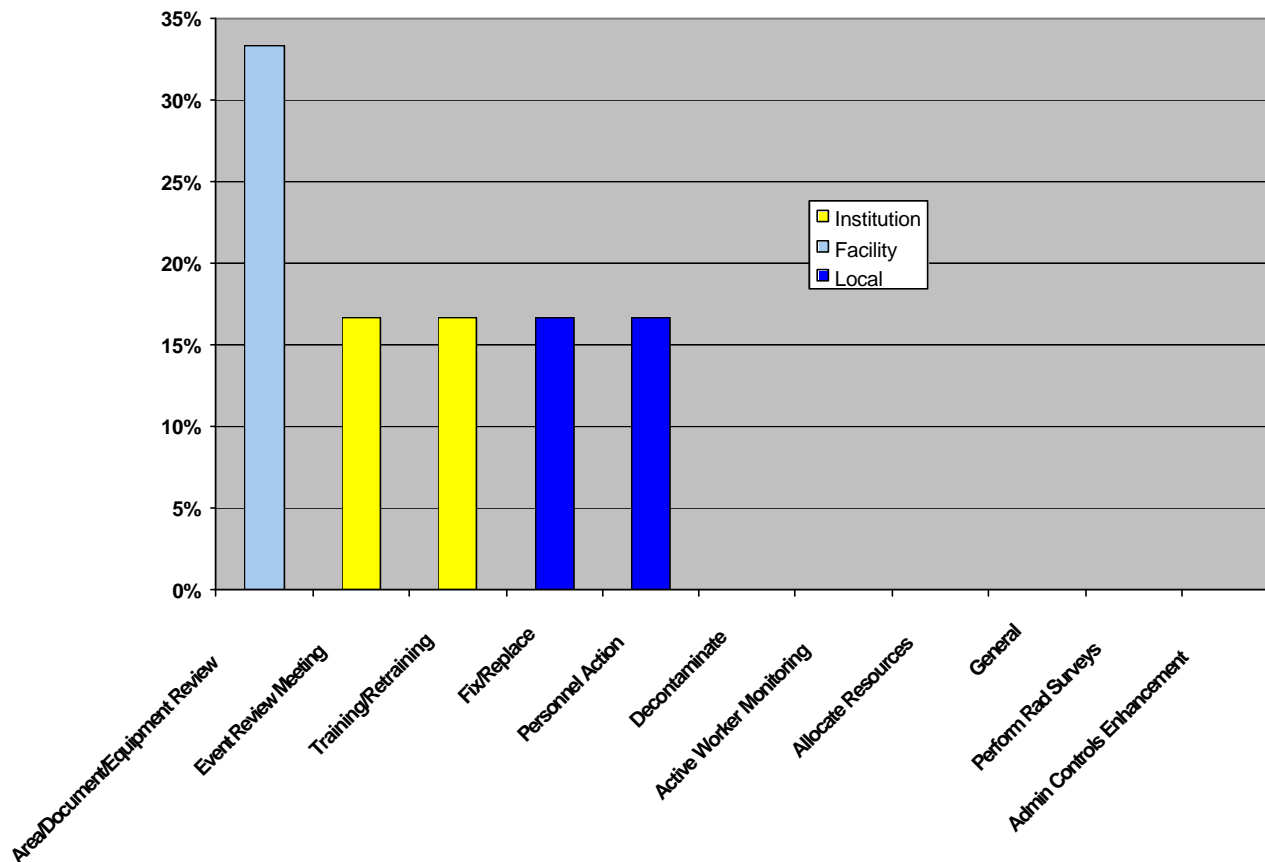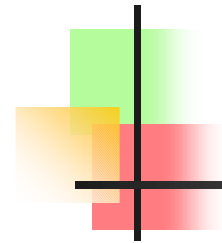
Performance Surety Actions for Personnel Safety Occurrences
(10/01/97 to 4/24/03)

• About 33% of performance surety actions involve Document or Equipment reviews, and 17% involve local repairs of equipment—matching share of Equipment Problems in direct and root causes
• About 33% of actions involve meetings or training at institutional level

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LANSCE Division Occurrences

FY2003
(6 month)

Los Alamos

LANSCE Occurrence Performance
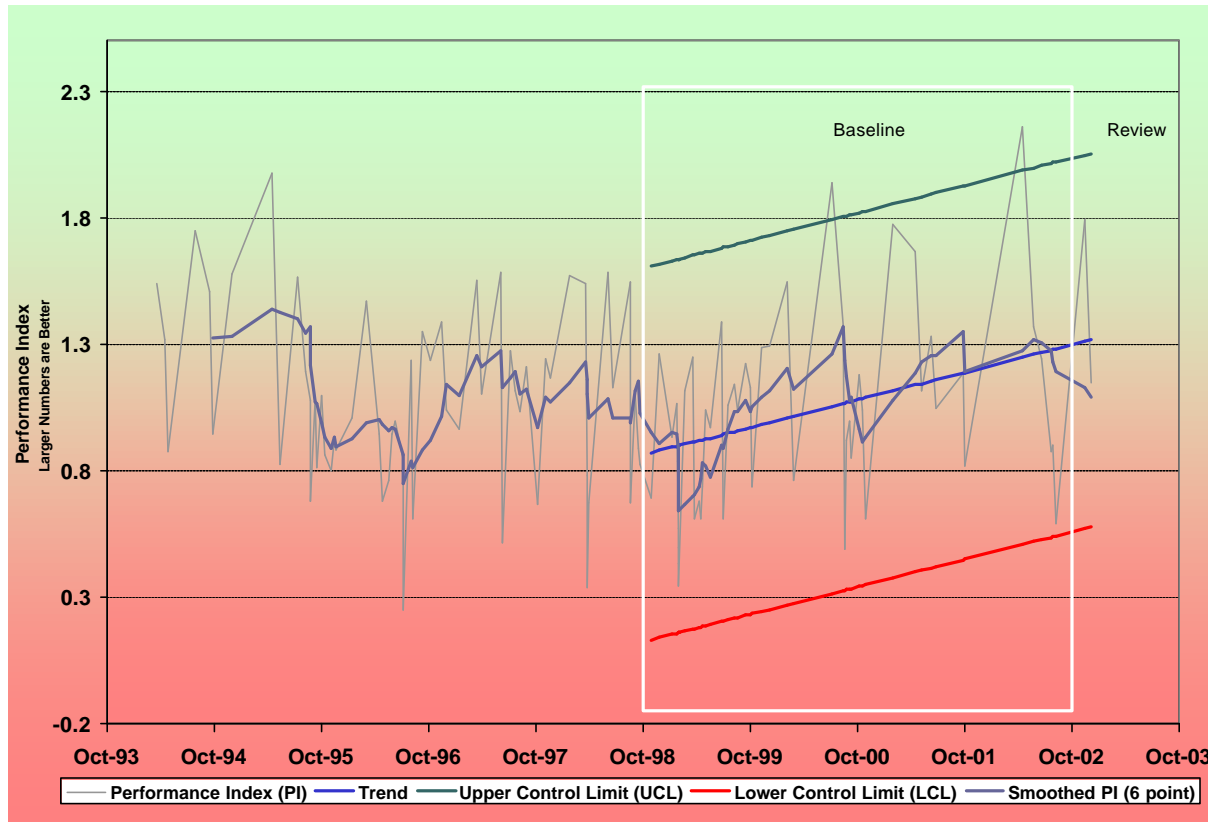
LANSCE PI Control Chart
(1/94 to 4/24/03)

- 112 events severity weighted 2, 3, or 4
  - Pre-Baseline: 60 events
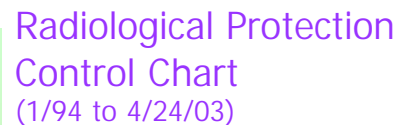 - Baseline: 50 events
  - Review: 2 events

| Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

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Type Distribution of LANSCE Occurrences
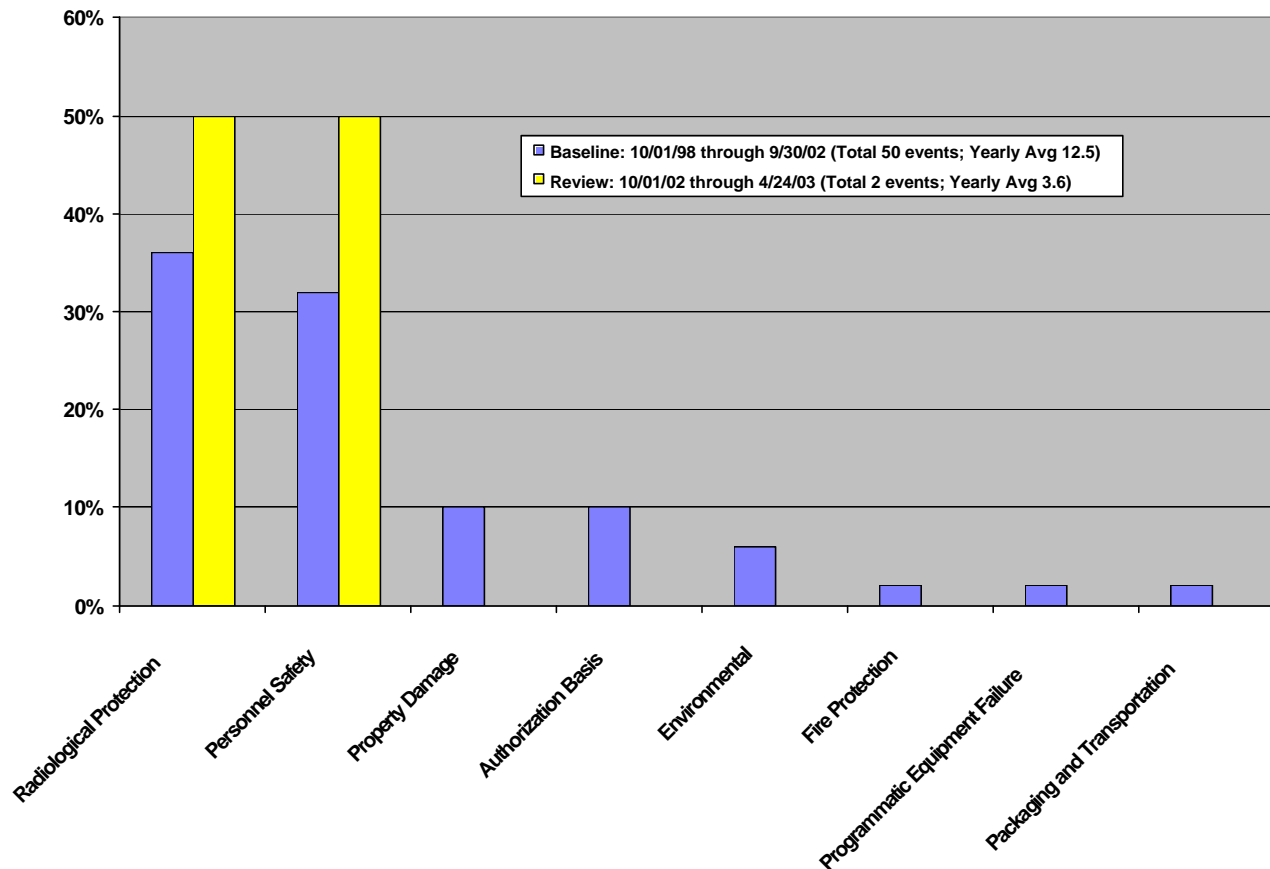
Occurrences by Type
Baseline vs. Review

- Radiological Protection increases from 36% of baseline to 50% of review period (1 event)

- Personnel Safety increases from 32% to 50% of review period (1 event)

- Absence of other types of occurrences during review period

Baseline: 10/01/98 through 9/30/02 (Total 50 events; Yearly Avg 12.5)
Review: 10/01/02 through 4/24/03 (Total 2 events; Yearly Avg 3.6)

Radiological Protection · Personnel Safety · Property Damage · Authorization Basis · Environmental · Fire Protection · Programmatic Equipment Failure · Packaging and Transportation

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LANSCE Radiological Protection Occurrence Performance

Radiological Protection Control Chart
(1/94 to 4/24/03)

- 51 events severity weighted 2, 3, or 4
  - Pre-Baseline: 32 events
  - Baseline: 18 events
  - Review: 1 event

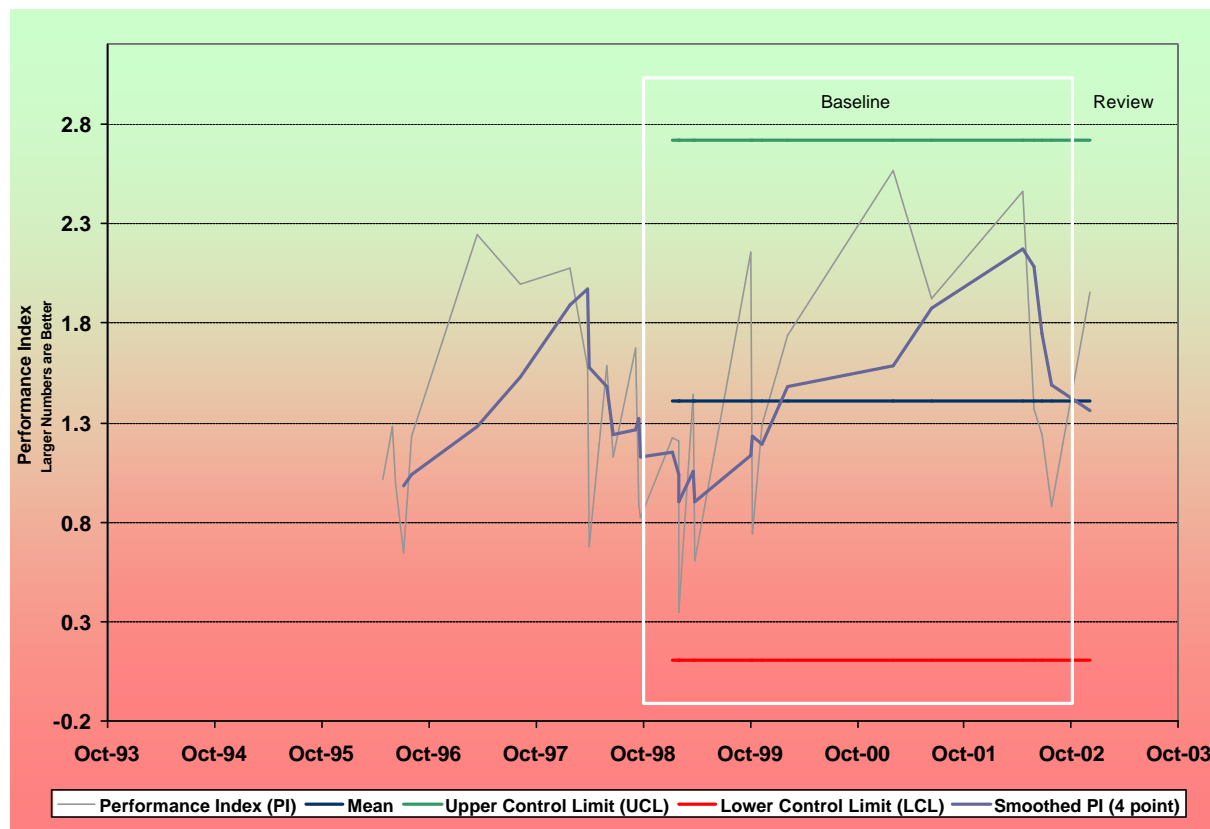| Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Types of LANSCE Radiological Protection Occurrences
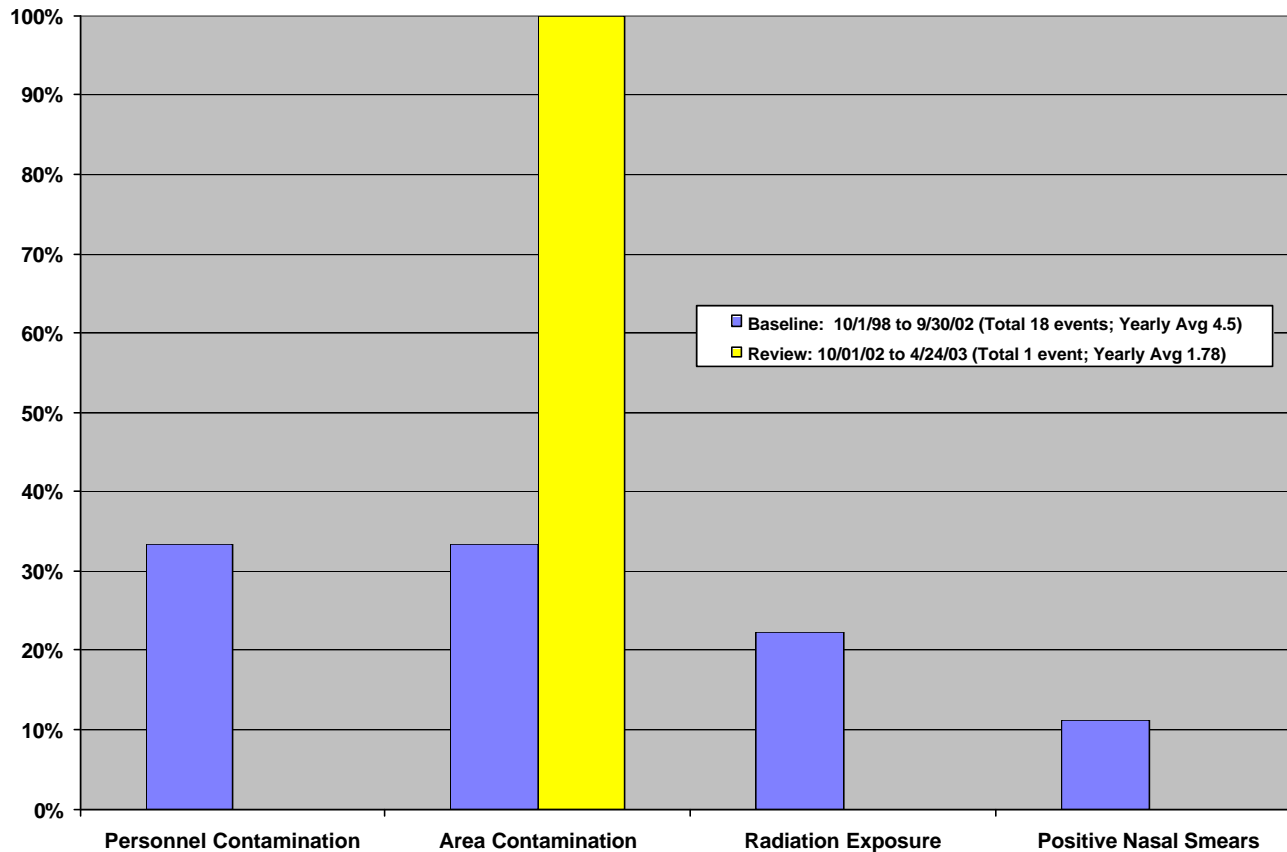
LANSCE Radiological Occurrences by Type
Baseline vs. Review

• Area Contamination accounts for 100% of radiological occurrences in review period (1 event)

• Absence of other types of radiological occurrences

Chart legend:
- Baseline: 10/1/98 to 9/30/02 (Total 18 events; Yearly Avg 4.5)
- Review: 10/01/02 to 4/24/03 (Total 1 event; Yearly Avg 1.78)

Categories: Personnel Contamination, Area Contamination, Radiation Exposure, Positive Nasal Smears

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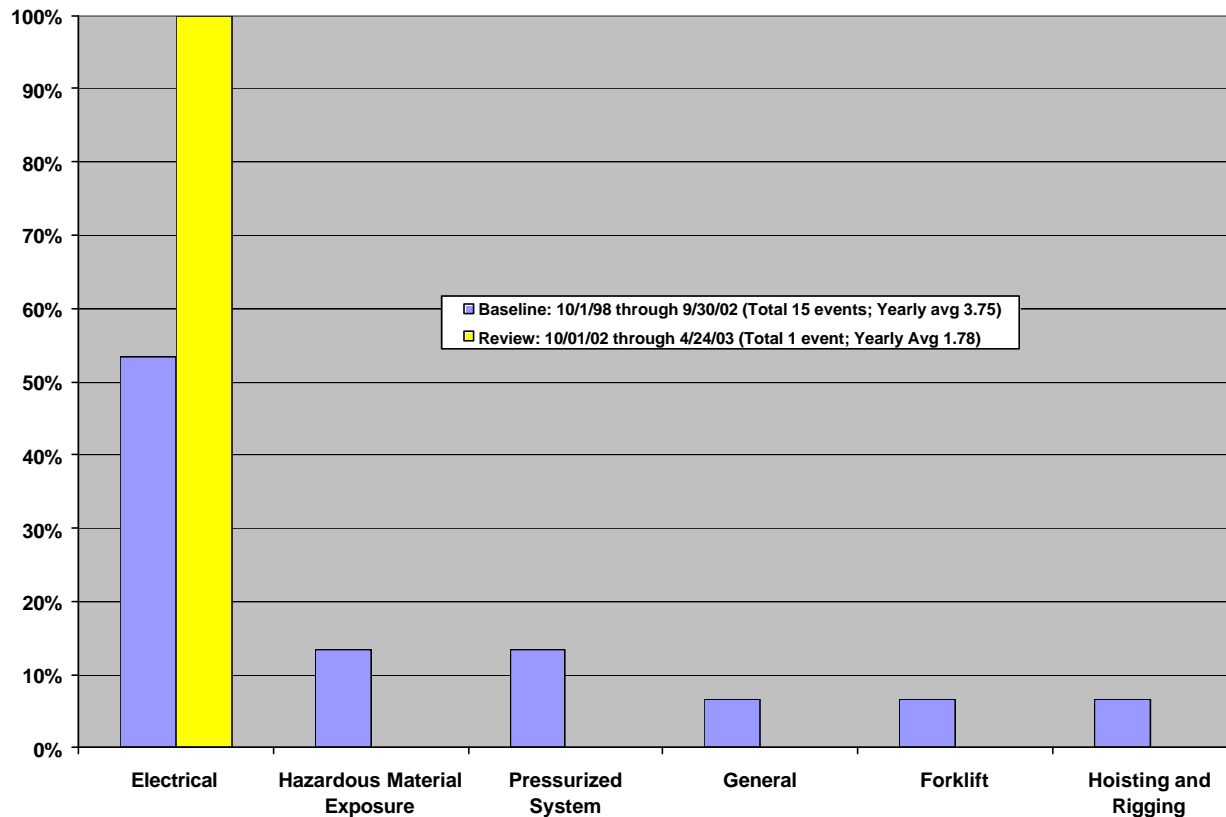# LANSCE Personnel Safety Occurrence Performance

Personnel Safety Control Chart
(10/95 to 4/24/03)

- 32 events severity weighted 2, 3, or 4
  - Baseline: 31 events
  - Review: 1 event

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Chart legend:
- Performance Index (PI)
- Mean
- Upper Control Limit (UCL)
- Lower Control Limit (LCL)
- Smoothed PI (4 point)

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Types of LANSCE Personnel Safety Occurrences
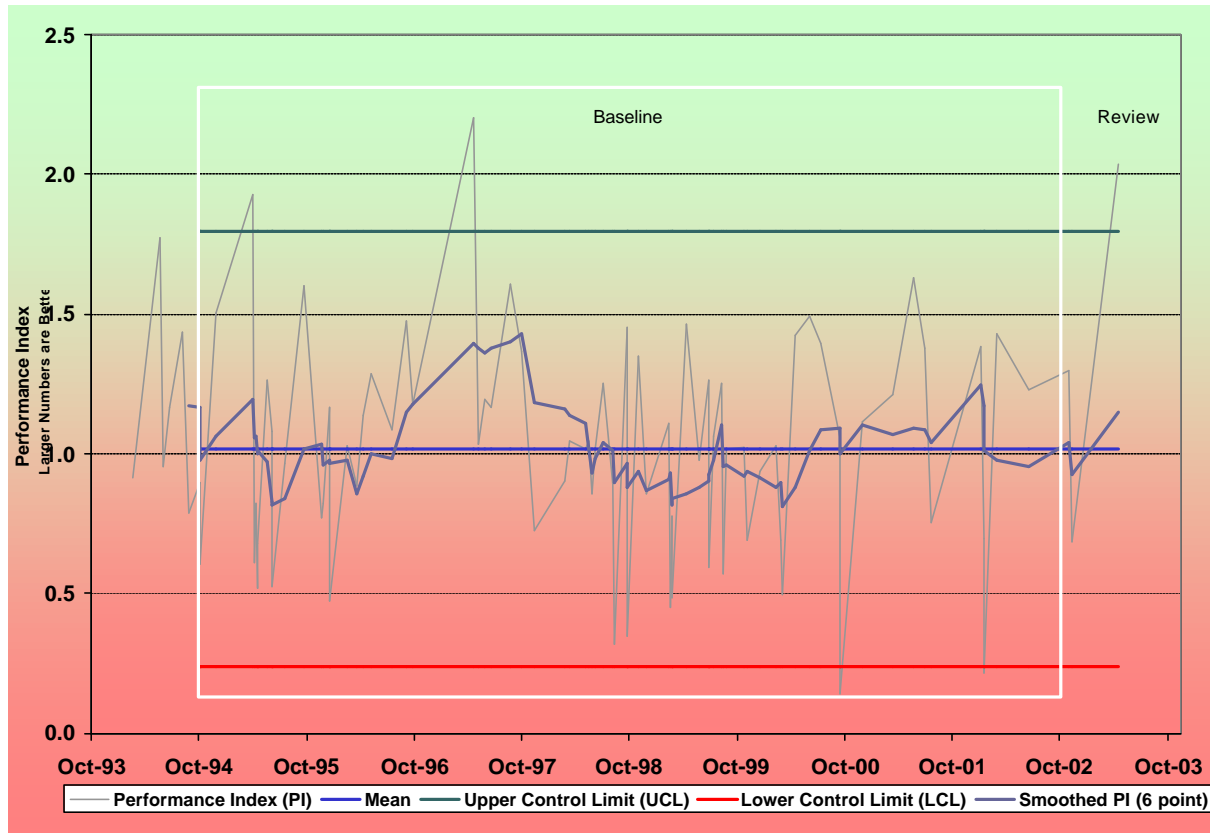
LANSCE Personnel Safety Occurrences by Type
Baseline vs. Review

• Electrical Safety accounts for 53% of baseline and 100% of review period (1 event)

• Disappearance of other personnel safety types

Legend:
- Baseline: 10/1/98 through 9/30/02 (Total 15 events; Yearly avg 3.75)
- Review: 10/01/02 through 4/24/03 (Total 1 event; Yearly Avg 1.78)

Categories: Electrical, Hazardous Material Exposure, Pressurized System, General, Forklift, Hoisting and Rigging

> Los Alamos

NIS Division Occurrences

FY2003
(6 month)

Los Alamos

NIS Occurrence Performance

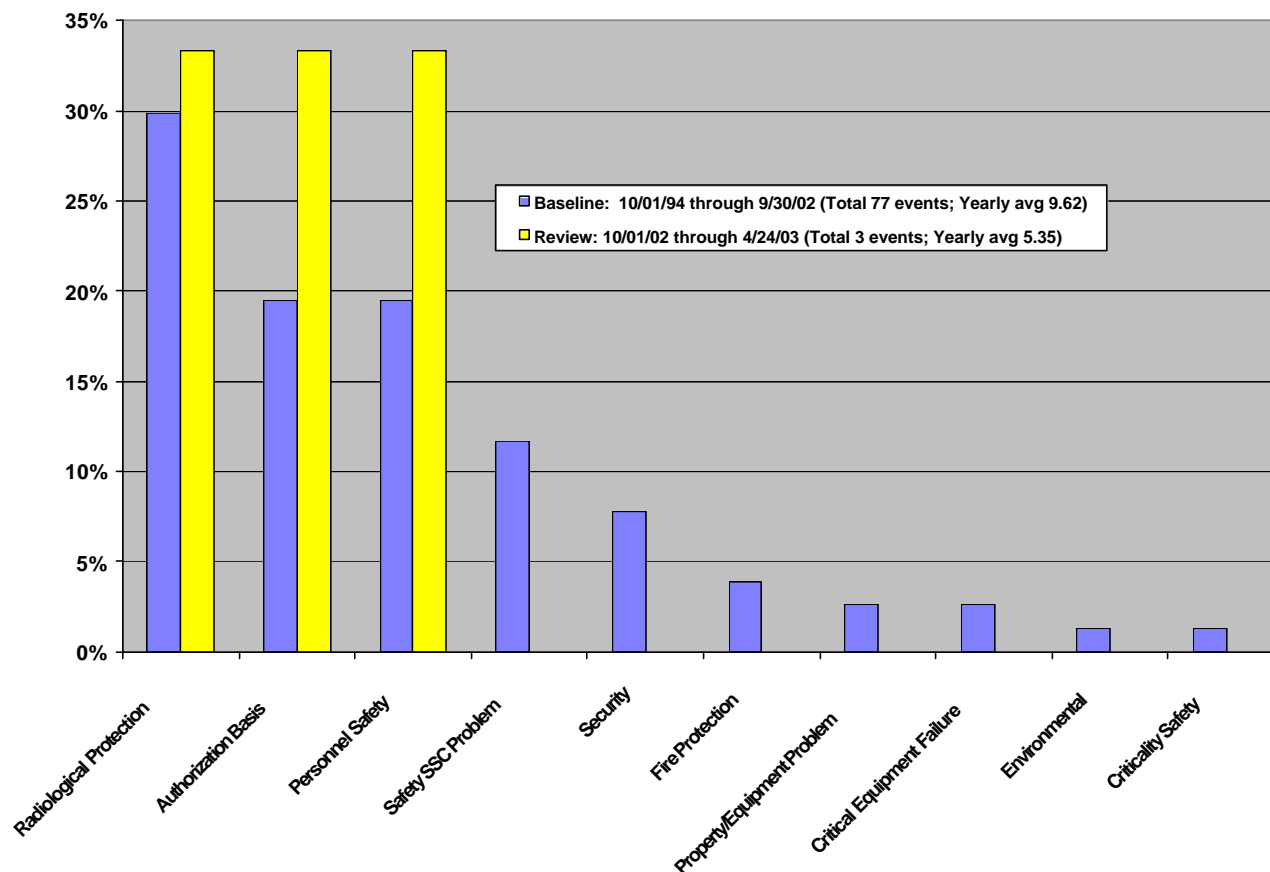**NIS PI Control Chart**
(1/94 to 4/24/03)

- 87 events severity weighted 2, 3, or 4
  - Pre-Baseline: 7 events
  - Baseline: 77 events
  - Review: 3 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
🟩	**Control Limit**
🟩	**OVERALL SCORE**

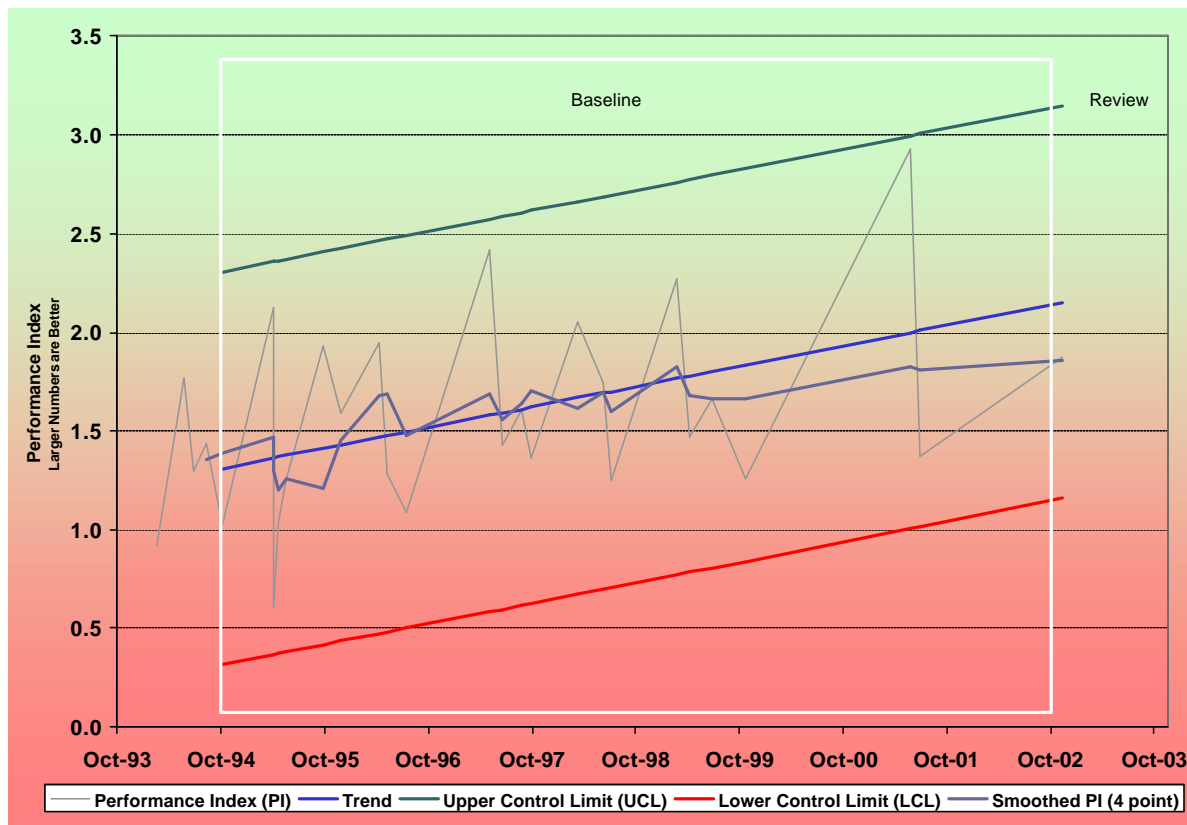Los Alamos

Type Distribution of NIS Occurrences

Occurrences by Type
Baseline vs. Review

• Radiological Protection remains static at about 33% of review period (1 event)

• Authorization Basis increases from about 19% to 33% (1 event)

• Personnel Safety increases from about 19% to 33% (1 event)

• Disappearance of other types

Chart legend:
- Baseline: 10/01/94 through 9/30/02 (Total 77 events; Yearly avg 9.62)
- Review: 10/01/02 through 4/24/03 (Total 3 events; Yearly avg 5.35)

Chart categories: Radiological Protection, Authorization Basis, Personnel Safety, Safety SSC Problem, Security, Fire Protection, Property/Equipment Problem, Critical Equipment Failure, Environmental, Criticality Safety

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NIS Radiological Protection Occurrence Performance

Radiological Protection Control Chart
(1/94 to 4/24/03)

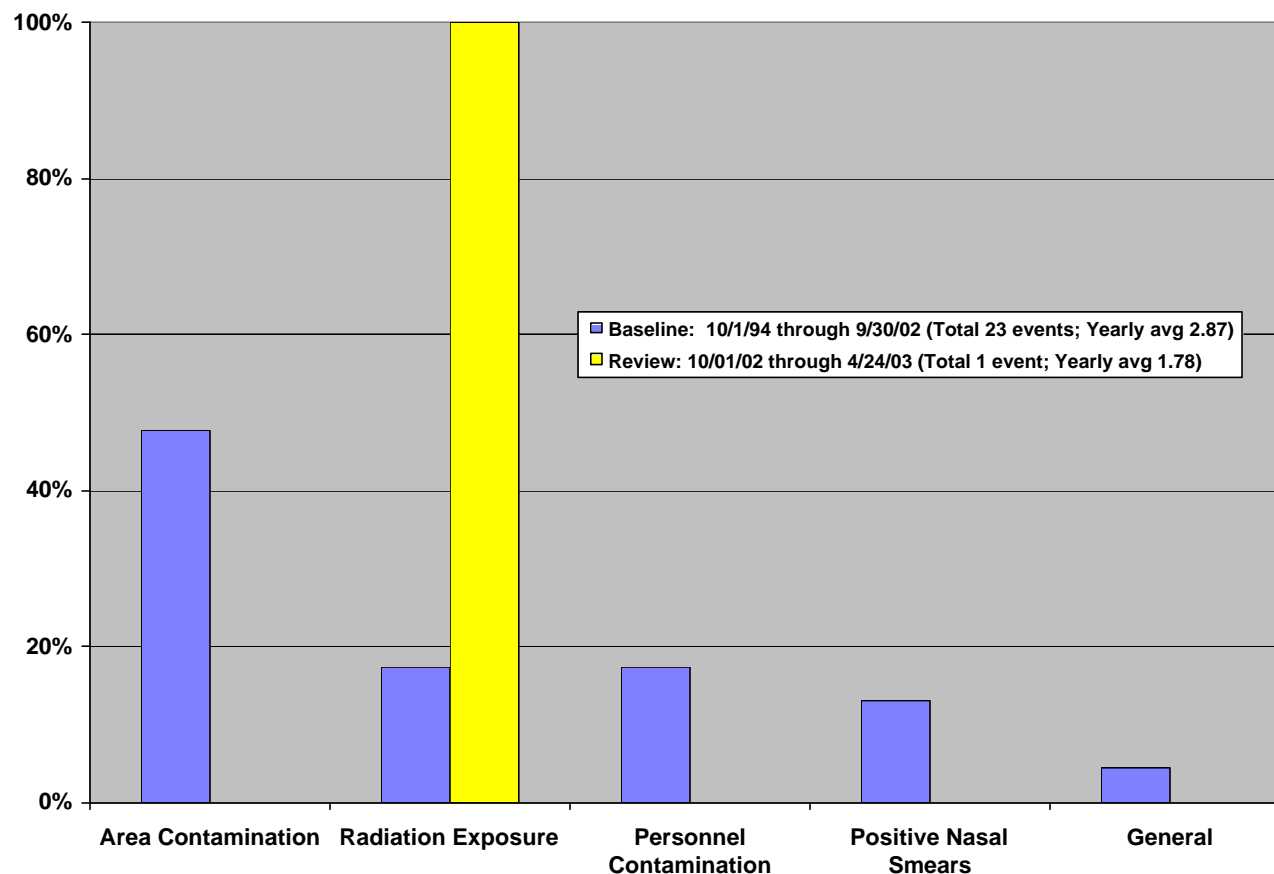- 29 events severity weighted 2 or 3
  - Pre-Baseline: 5 events
  - Baseline: 23 events
  - Review: 1 event

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Types of NIS Radiological Protection Occurrences

NIS Radiological Protection Occurrences by Type
Baseline vs. Review

- Radiation Exposure accounts for 100% of radiological protection events in review period (1 event)

- Absence of other radiological protection types
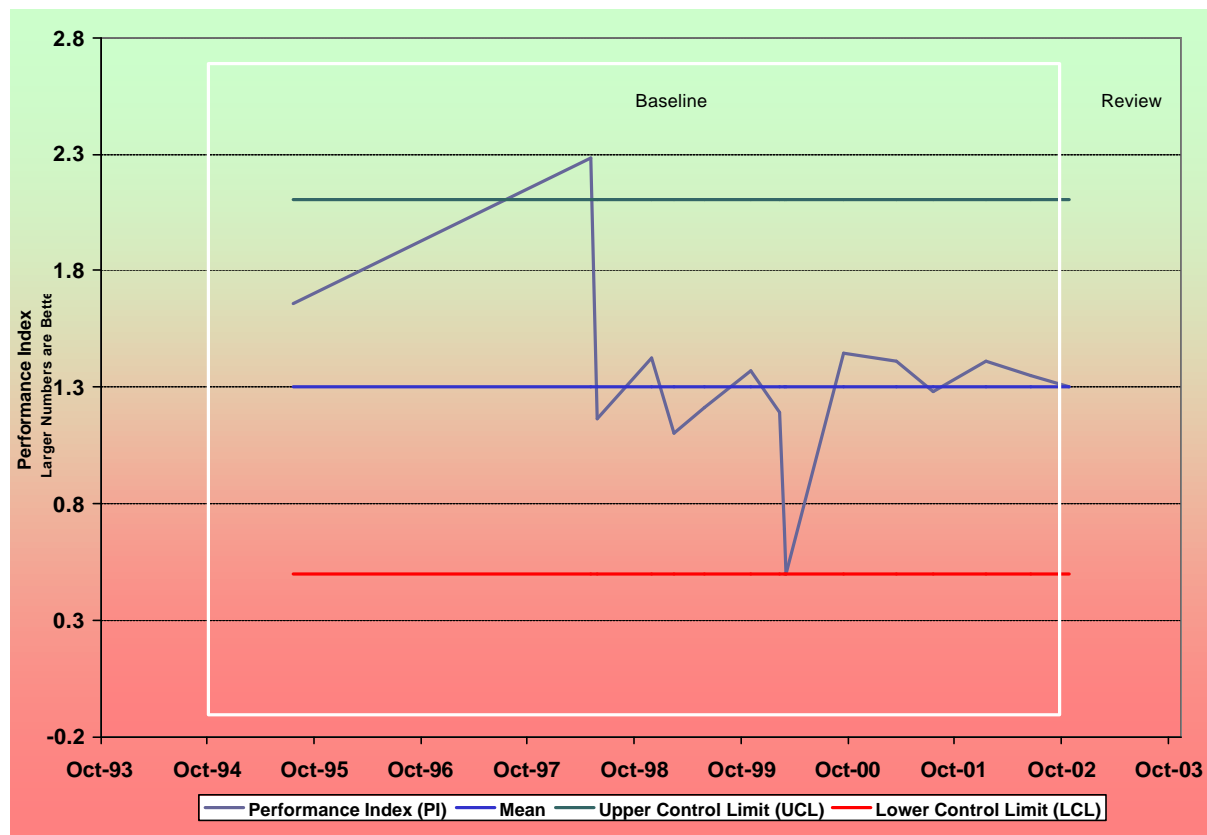
Legend:
- Baseline: 10/1/94 through 9/30/02 (Total 23 events; Yearly avg 2.87)
- Review: 10/01/02 through 4/24/03 (Total 1 event; Yearly avg 1.78)

Chart categories: Area Contamination, Radiation Exposure, Personnel Contamination, Positive Nasal Smears, General

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NIS Authorization Basis Occurrence Performance

Authorization Basis Control Chart
(1/94 to 4/24/03)

- 17 events severity weighted 2 or 3
  - Baseline: 16 events
  - Review: 1 event

Review Period Score	
	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
	Annualized Rate
N/A	Control Limit
	OVERALL SCORE

Types of NIS Authorization Basis Occurrences
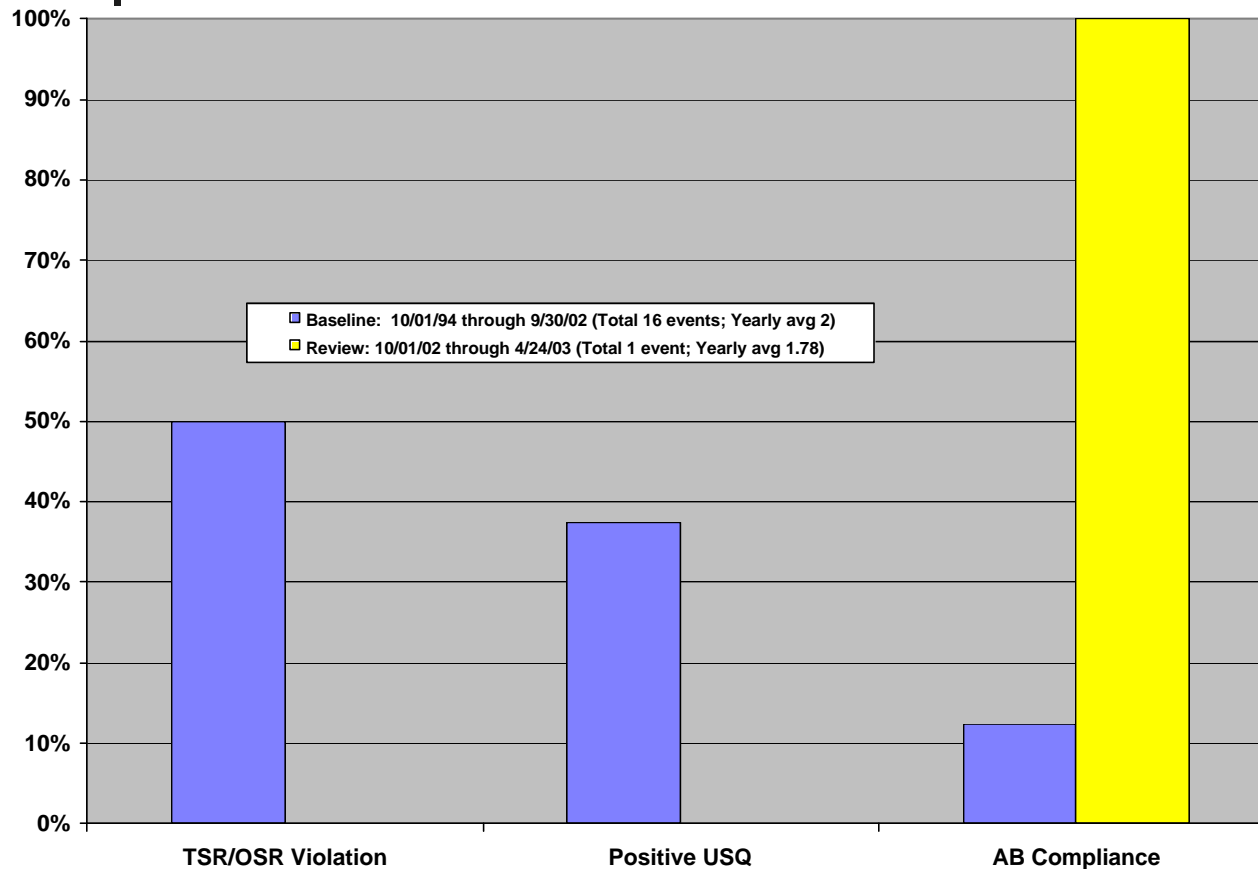
NIS AB Occurrences by Type
Baseline vs. Review

• Disappearance of predominant types TSR/OSR Violation and Positive USQ during review period

• Emergence of AB Compliance during review period (1 event)

Chart legend:
- Baseline: 10/01/94 through 9/30/02 (Total 16 events; Yearly avg 2)
- Review: 10/01/02 through 4/24/03 (Total 1 event; Yearly avg 1.78)

X-axis categories: TSR/OSR Violation, Positive USQ, AB Compliance

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Direct Causes of NIS Authorization Basis Occurrences
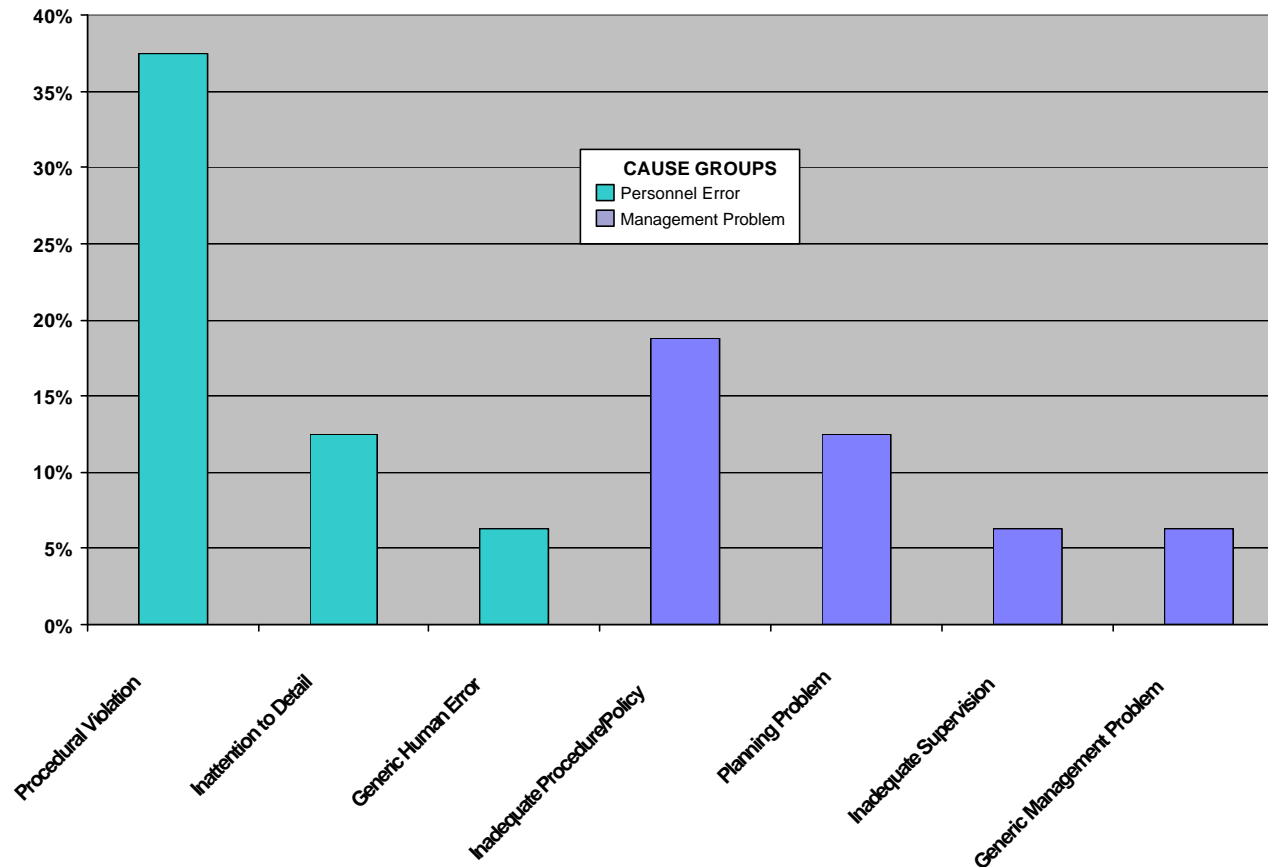
Direct Causes
Baseline and Review

• Personnel Error identified as direct cause in 56% of NIS authorization basis events
• Management Problem identified as direct cause in 44% of events
• Procedural violations and inadequate procedures are predominant within their cause groups

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Root Causes of NIS Authorization Basis Occurrences
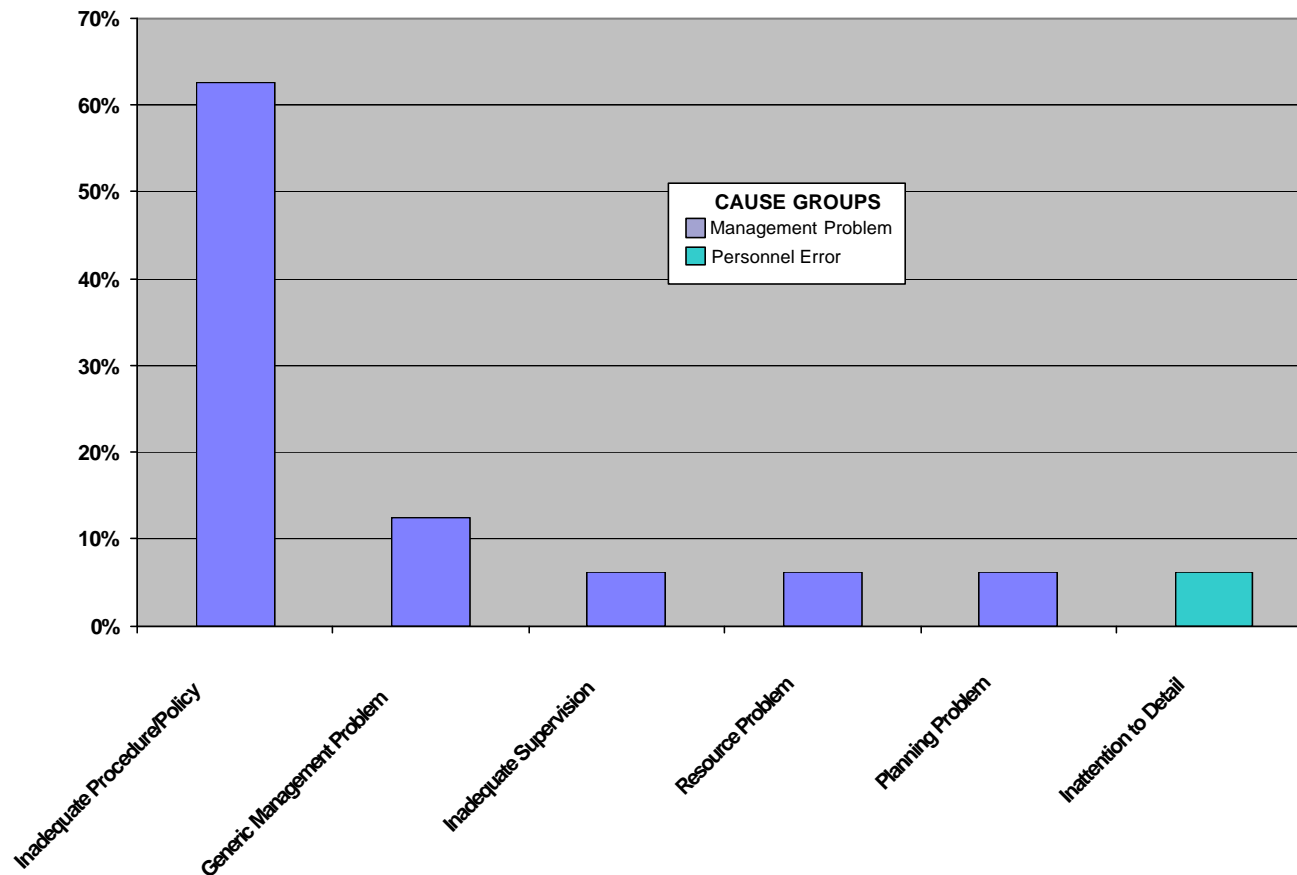
Root Causes
Baseline and Review

• Management problems are predominant root cause for NIS authorization basis events—94% of total

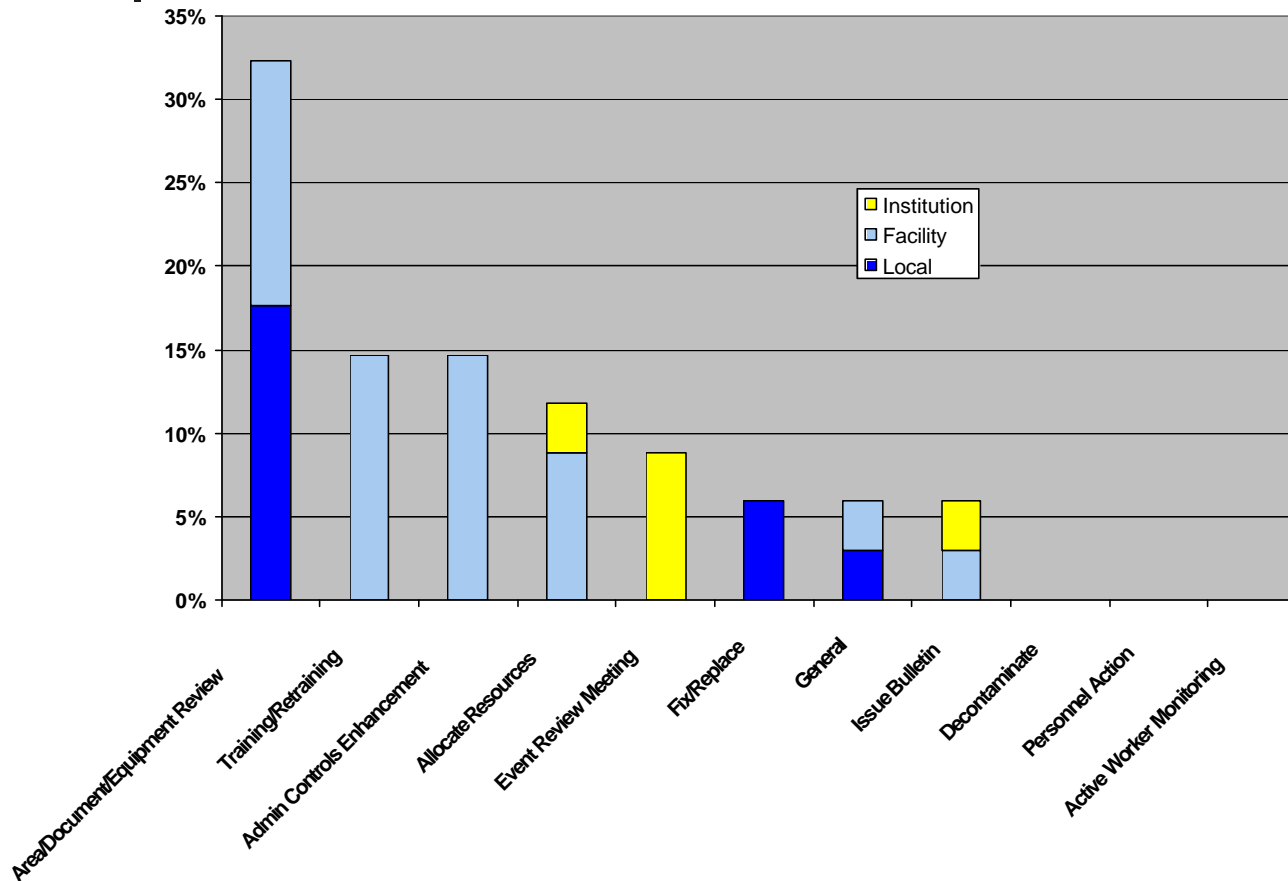• Personnel Error identified as root cause in 6% of events

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Profile of NIS Corrective Actions for Authorization Basis
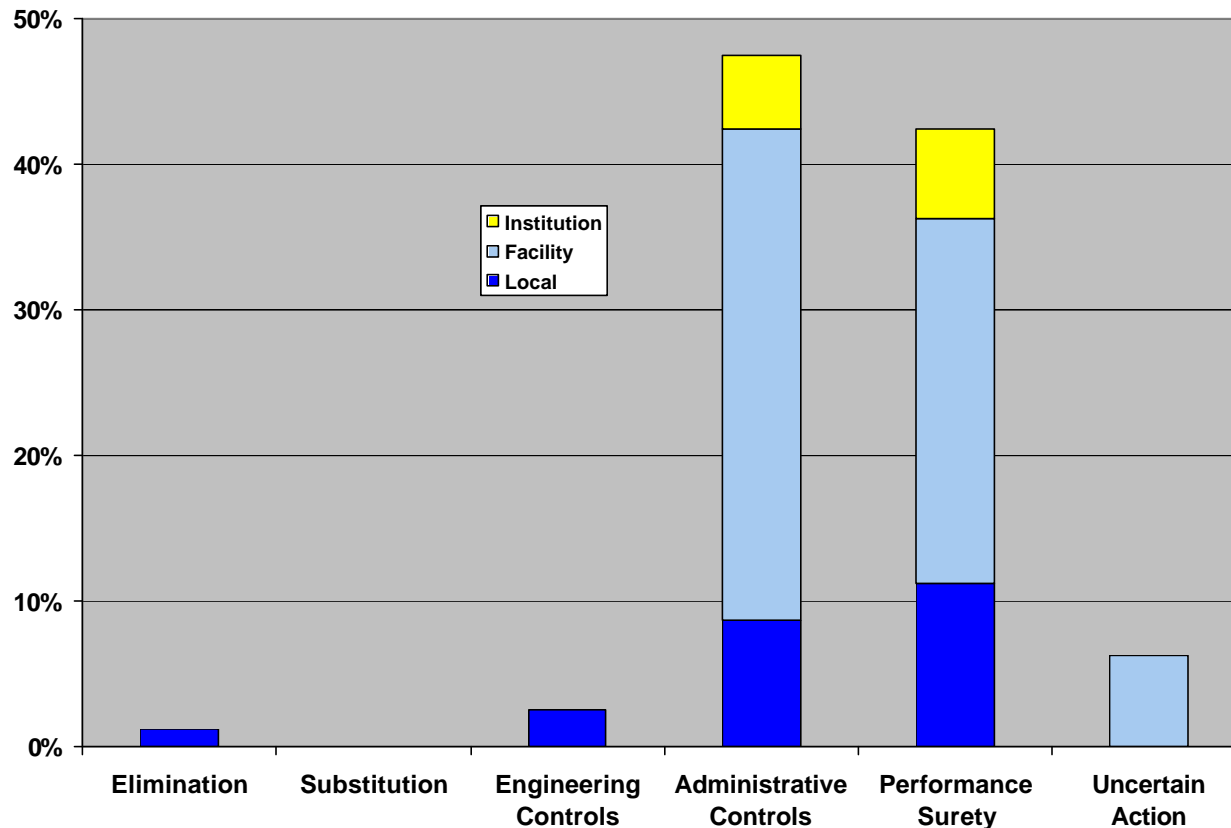
Corrective Actions
(10/97 to 4/24/03)

• About 1% of actions target eliminating or substituting for lesser hazard

• About 3% of actions specify new or modified engineering barriers

• 11% of all actions targeted at institutional level

• More than 90% of all actions target procedural changes or "performance surety"—driven by causal pattern of procedural violations and inadequate procedures/ policies

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

X-axis: Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

Y-axis: 0% to 50%

NIS Performance Surety Actions for Authorization Basis

Performance Surety Actions
(10/01/97 to Present)

• Most performance surety actions involve responses at the local or facility level—area/ document/equipment reviews, training sessions, enhanced admin controls, etc.
• No actions involve active monitoring of worker performance

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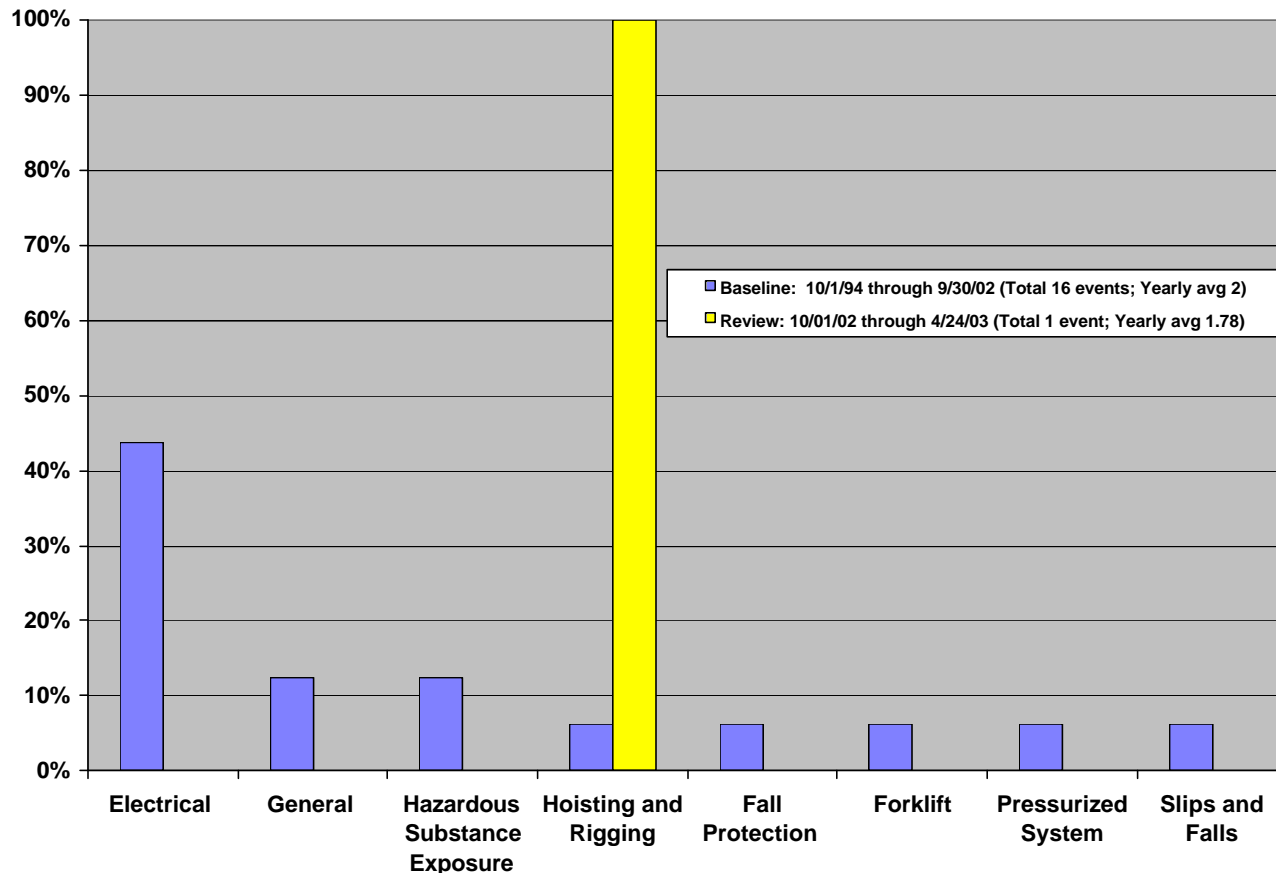
NIS Personnel Safety Occurrence Performance
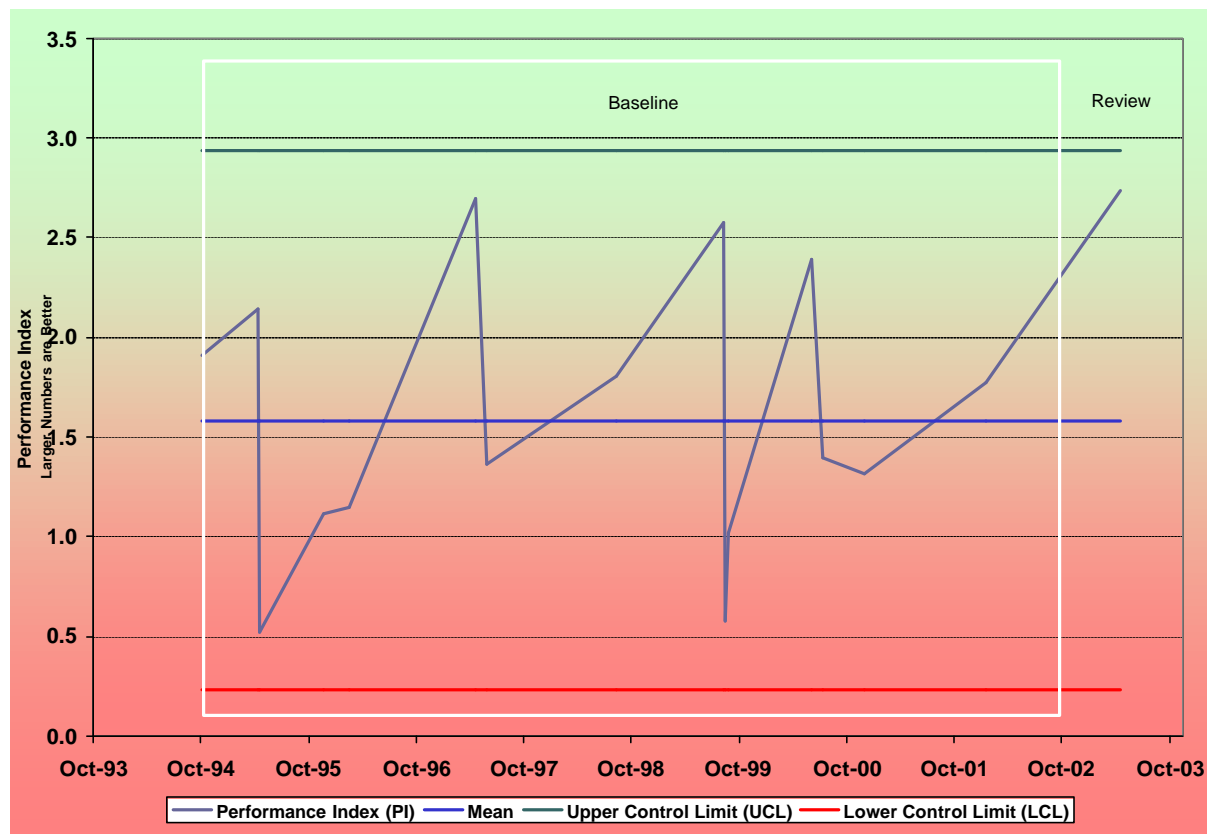
Personnel Safety Control Chart
(1/94 to 4/24/03)

- 17 events severity weighted 2, 3, or 4
  - Baseline: 16 events
  - Review: 1 event

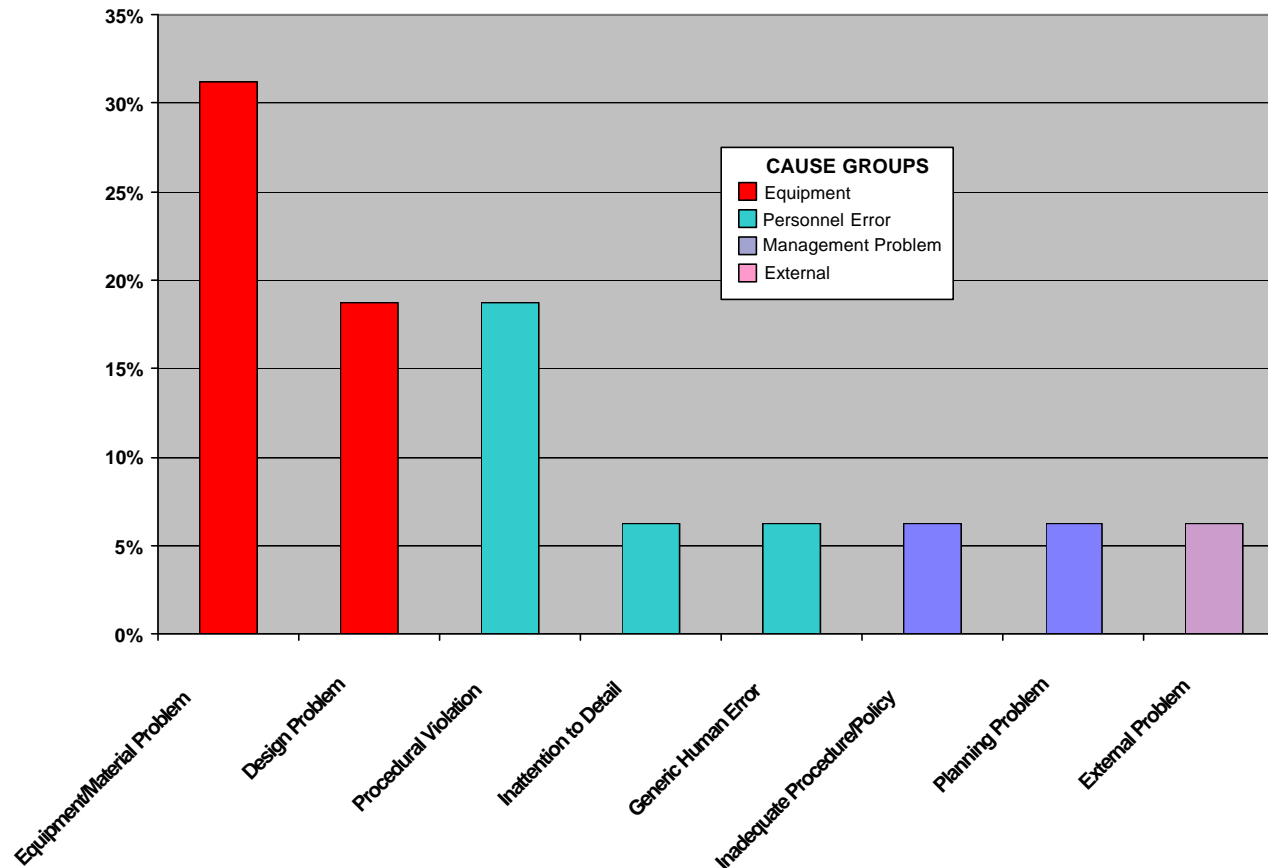| Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟨	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Types of NIS Personnel Safety Occurrences

NIS Personnel Safety Occurrences by Type
Baseline vs. Review

• Hoisting and Rigging increases from 6% of baseline to 100% of review period (1 event)

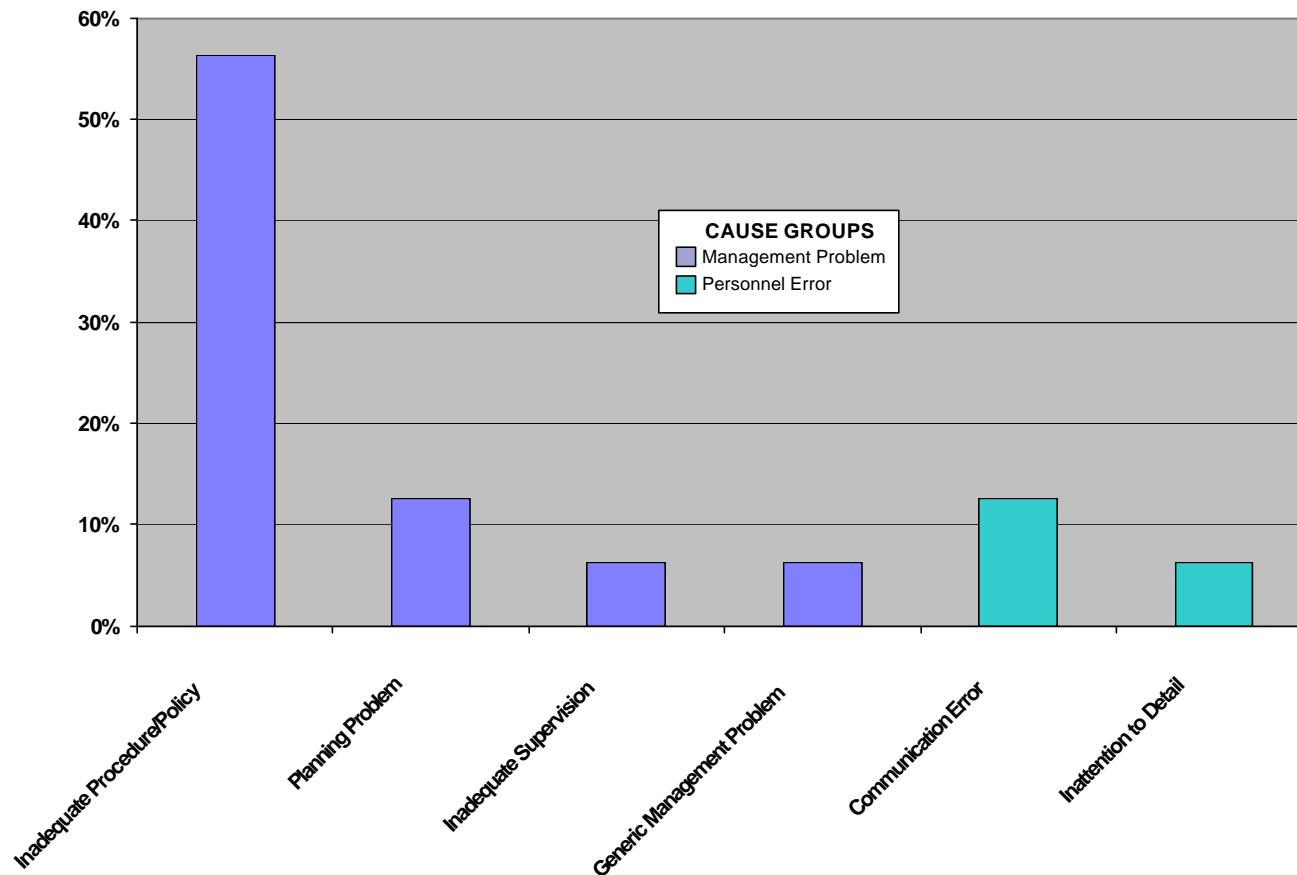• Disappearance of other Personnel Safety types during review period

Legend from chart:
- Baseline: 10/1/94 through 9/30/02 (Total 16 events; Yearly avg 2)
- Review: 10/01/02 through 4/24/03 (Total 1 event; Yearly avg 1.78)

Chart categories: Electrical, General, Hazardous Substance Exposure, Hoisting and Rigging, Fall Protection, Forklift, Pressurized System, Slips and Falls

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Direct Causes of NIS Personnel Safety Occurrences

Direct Causes
Baseline and Review

• Equipment Problems and Personnel Error are predominant direct causes—50% and 31% respectively
• Management Problem and External Problem account for remaining 19% of events

CAUSE GROUPS
- Equipment
- Personnel Error
- Management Problem
- External

Equipment/Material Problem
Design Problem
Procedural Violation
Inattention to Detail
Generic Human Error
Inadequate Procedure/Policy
Planning Problem
External Problem

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Root Causes of NIS Personnel Safety Occurrences

Root Causes
Baseline and Review

• Management problems identified as root cause in 81% of events
• Inadequate procedures predominant within cause group
• Personnel Error accounts for 19% of total events

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Profile of NIS Corrective Actions for Personnel Safety
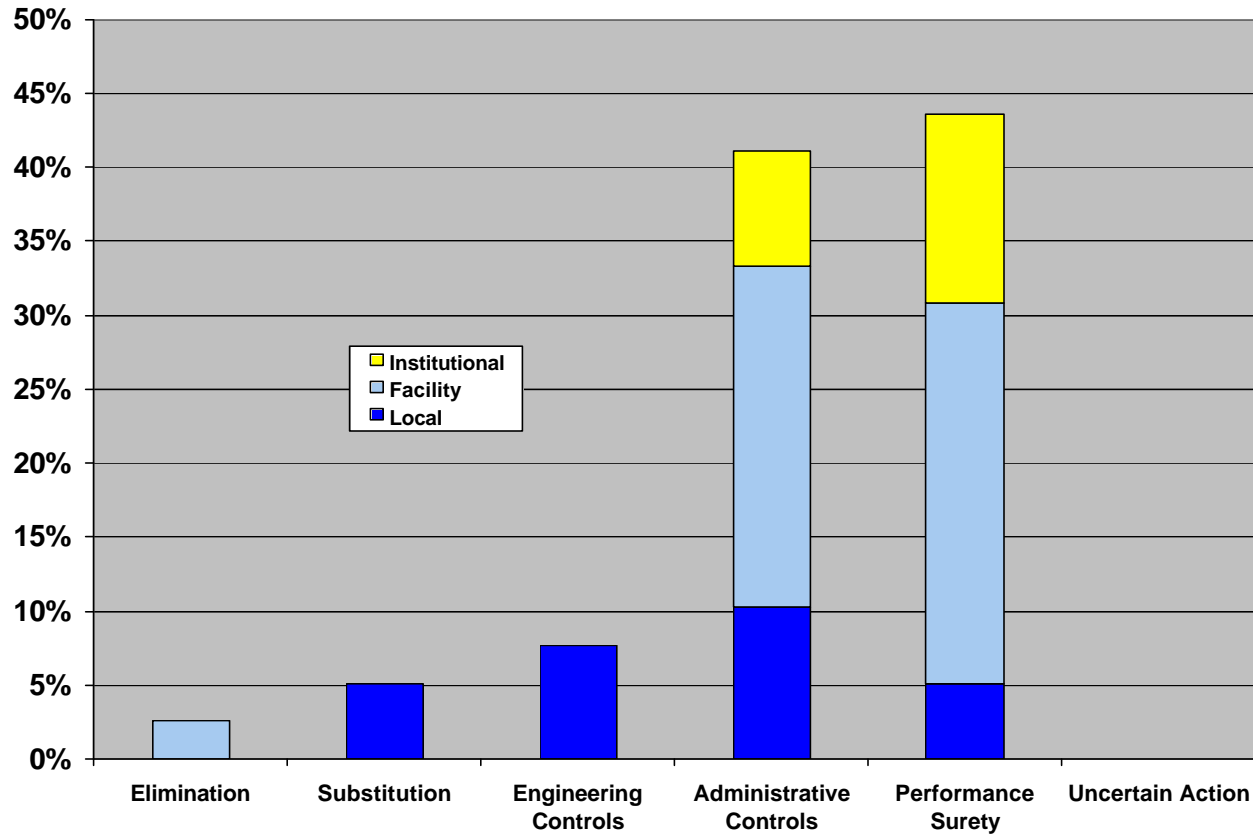
Corrective Actions
(10/97 to 4/24/03)

• About 8% of actions target eliminating or substituting for lesser hazard
• About 8% of actions specify new or modified engineering barriers
• About 84% of all actions target procedural changes or "performance surety"

NIS Performance Surety Actions for Personnel Safety
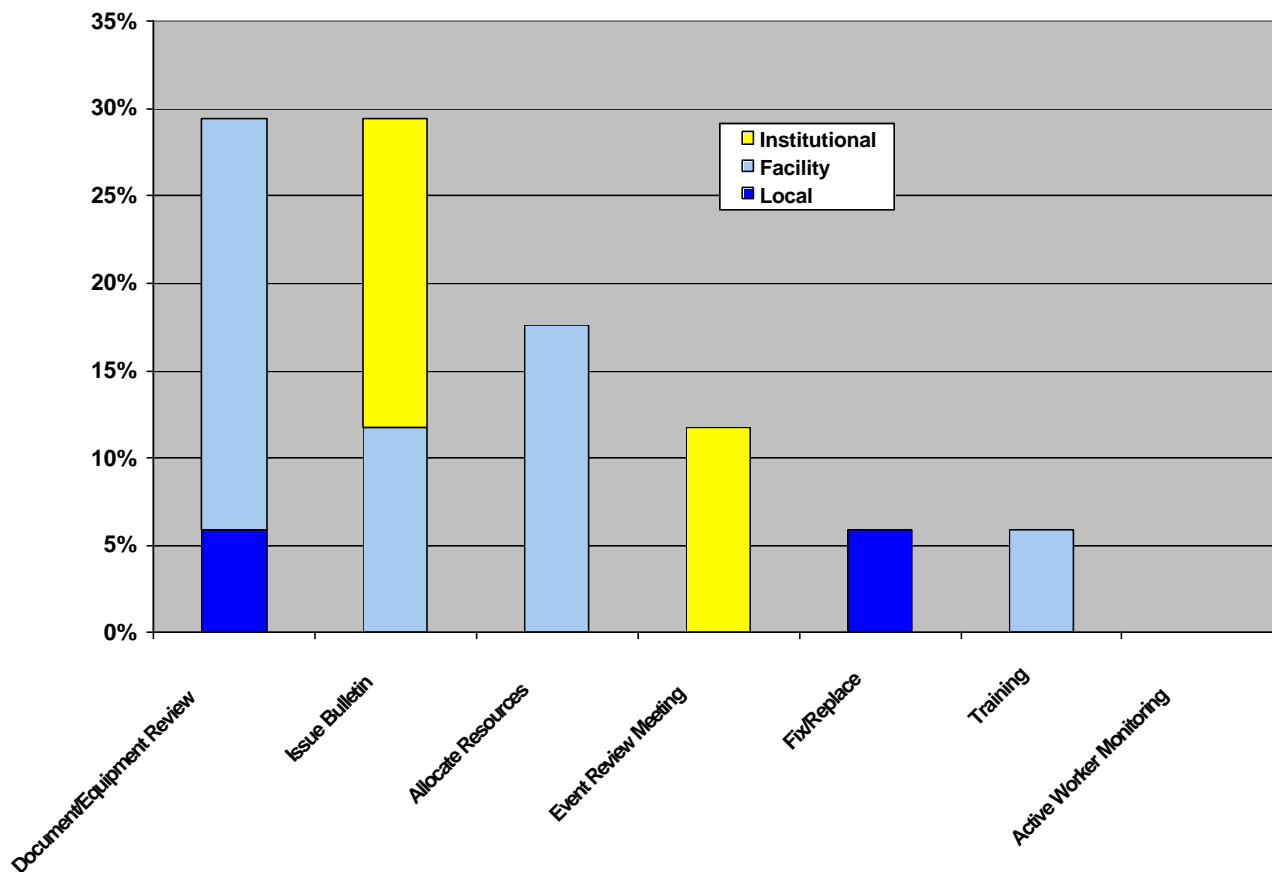
Performance Surety Actions
(10/97 to 4/24/03)

• Many performance surety actions involve reactive, one-time responses— document/equipment reviews, event reviews, equipment repairs, etc.
• No actions involve training or active monitoring of worker performance

Legend:
- Institutional
- Facility
- Local

Chart categories (x-axis): Document/Equipment Review, Issue Bulletin, Allocate Resources, Event Review Meeting, Fix/Replace, Training, Active Worker Monitoring

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DX Division Occurrences

FY2003
(6 month)

Los Alamos

DX Occurrence Performance

DX PI Control Chart
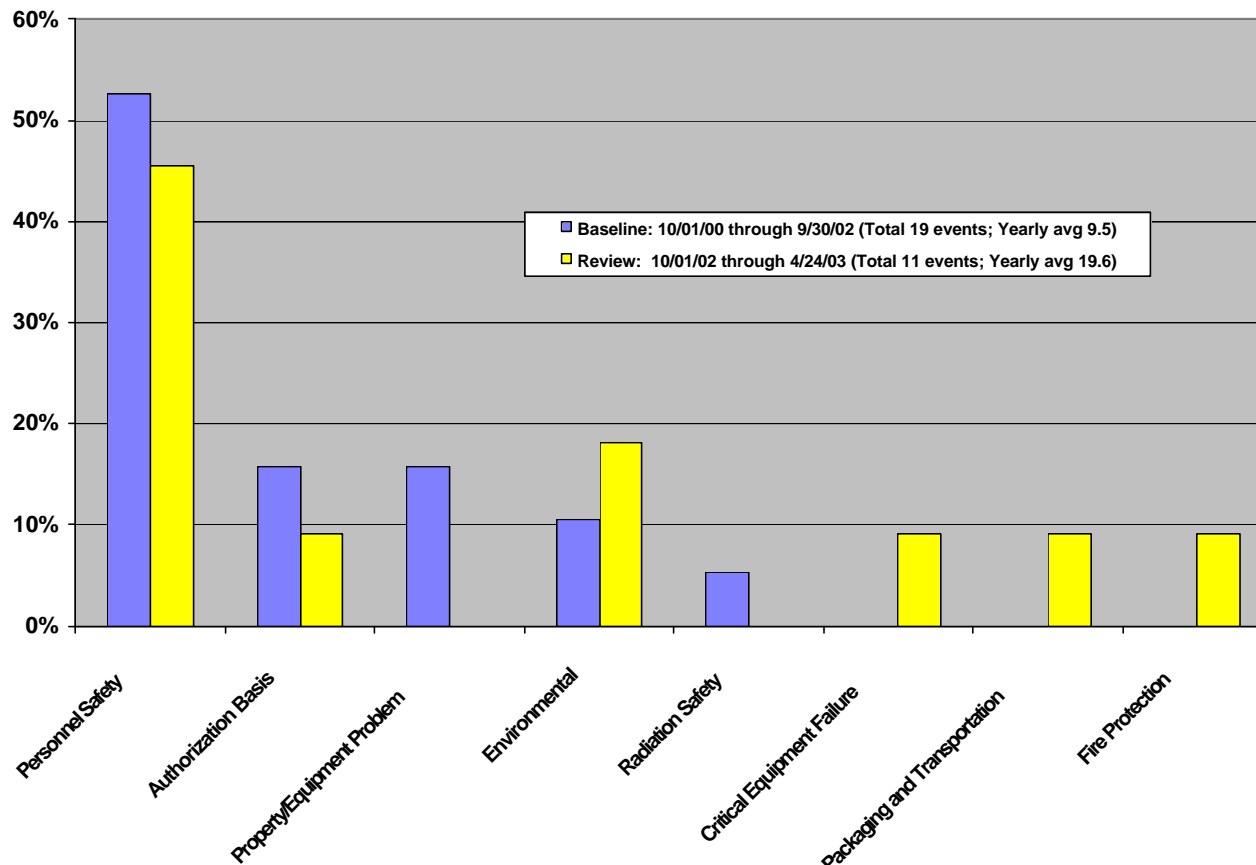(1/94 to 4/24/03)

- 86 events severity weighted 2, 3, or 4
  - Pre-Baseline: 56 events
  - Baseline: 19 events
  - Review: 11 events
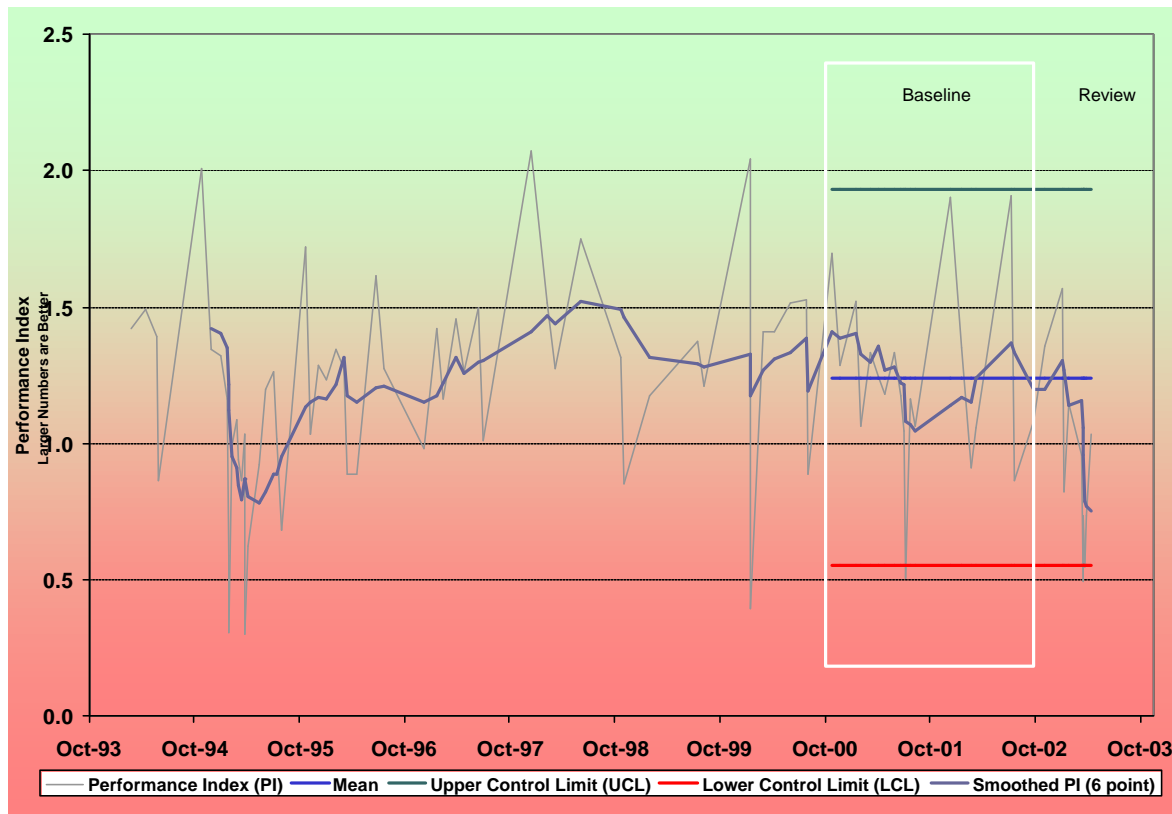
Review Period Score	
🟨	Sustained Performance
🟥	Review Period Trend
🟥	Over/Under Trend
🟥	Annualized Rate
🟥	Control Limit
🟥	OVERALL SCORE

Chart legend: Performance Index (PI) — Mean — Upper Control Limit (UCL) — Lower Control Limit (LCL) — Smoothed PI (6 point)

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Type Distribution of DX Occurrences

Occurrences by Type
Baseline vs. Review

Legend:
- Baseline: 10/01/00 through 9/30/02 (Total 19 events; Yearly avg 9.5)
- Review: 10/01/02 through 4/24/03 (Total 11 events; Yearly avg 19.6)

Chart categories (x-axis): Personnel Safety, Authorization Basis, Property/Equipment Problem, Environmental, Radiation Safety, Critical Equipment Failure, Packaging and Transportation, Fire Protection

• Predominance of Personnel Safety events in baseline and review—53% and 45% respectively

• Authorization basis occurrences decrease from 16% to 9%

• Environmental occurrences increase from 11% to 18%

• Emergence of Critical Equipment Failure, P&T, and Fire Protection

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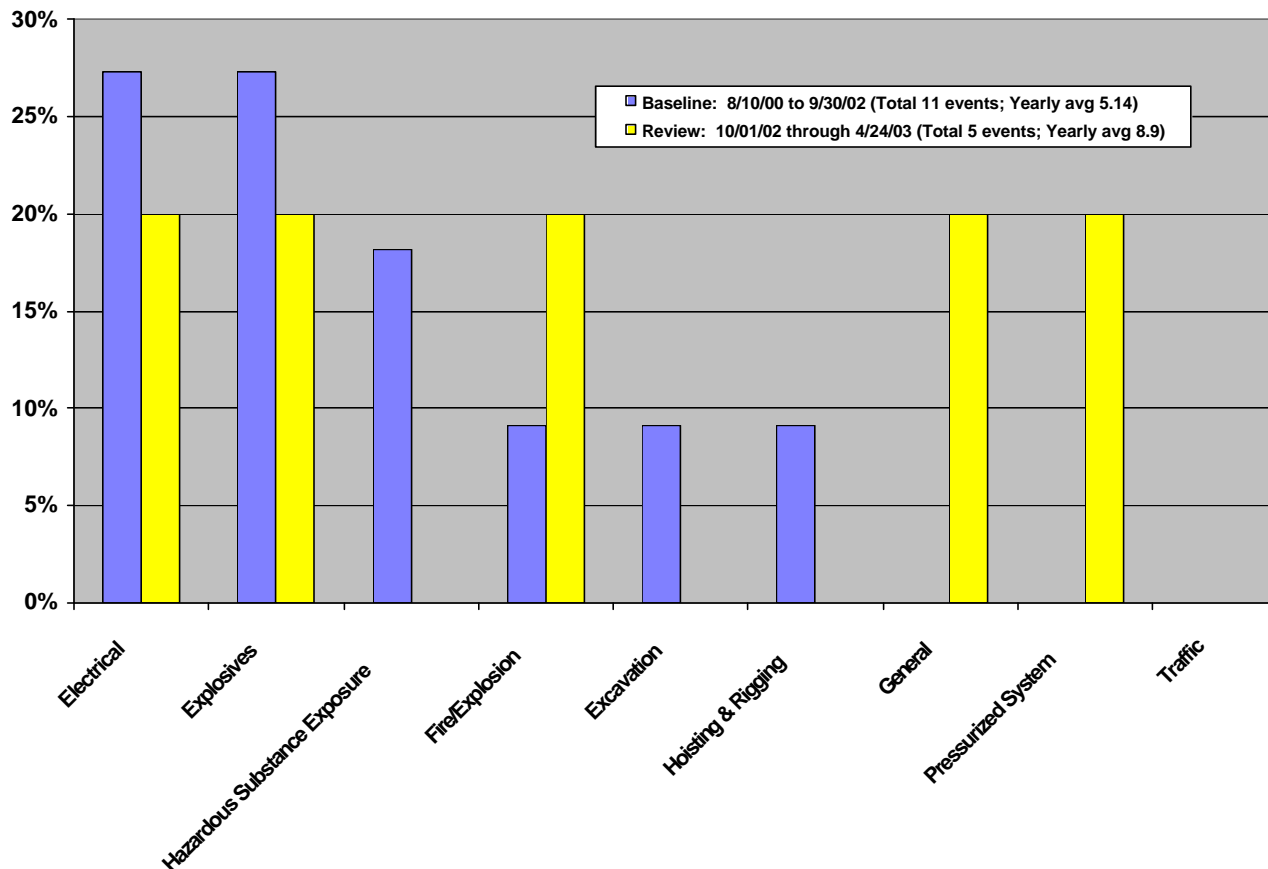# DX Personnel Safety Occurrence Performance

Personnel Safety Control Chart
(1/94 to 4/24/03)

- 50 events severity weighted 2, 3, or 4
  - Pre-Baseline: 34 events
  - Baseline: 11 events
  - Review: 5 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
🟥	**Over/Under Trend**
🟥	**Annualized Rate**
🟥	**Control Limit**
🟥	**OVERALL SCORE**
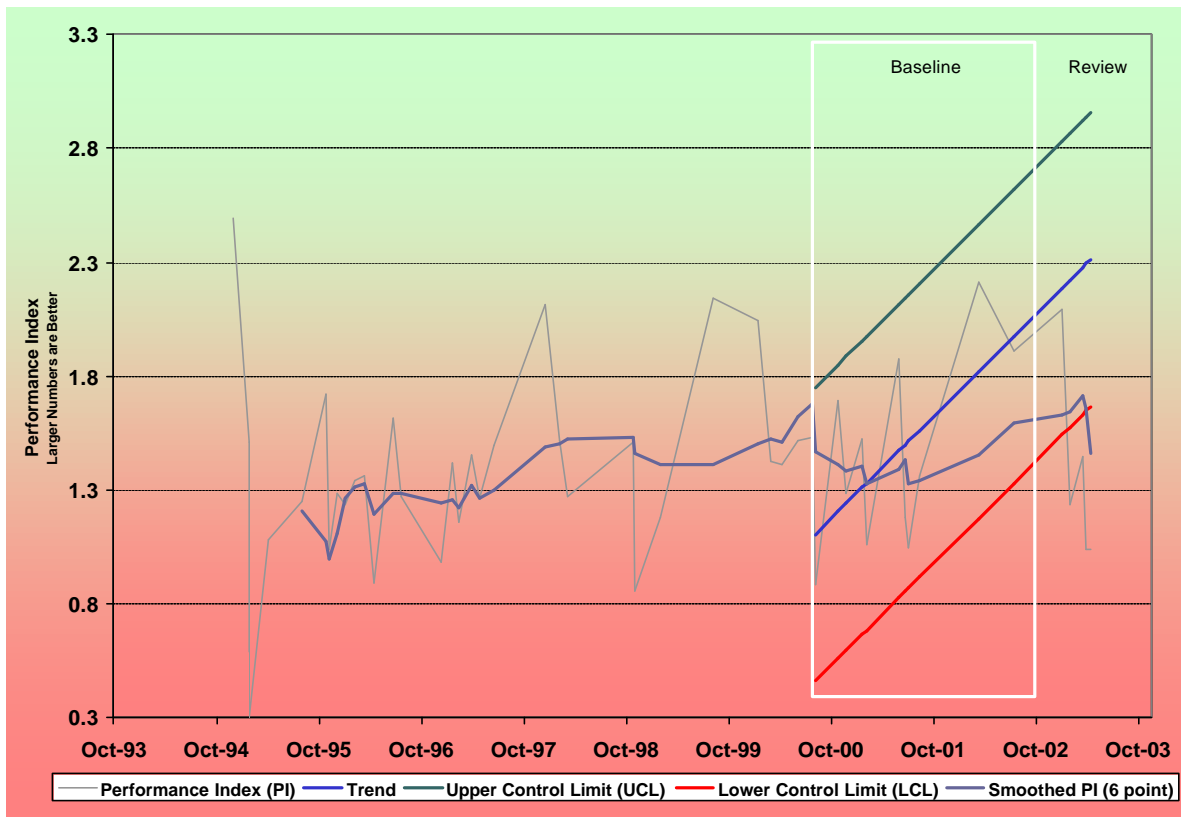
Types of DX Personnel Safety Occurrences

DX Personnel Safety Occurrences by Type
Baseline vs. Review

Legend:
- Baseline: 8/10/00 to 9/30/02 (Total 11 events; Yearly avg 5.14)
- Review: 10/01/02 through 4/24/03 (Total 5 events; Yearly avg 8.9)

Categories: Electrical, Explosives, Hazardous Substance Exposure, Fire/Explosion, Excavation, Hoisting & Rigging, General, Pressurized System, Traffic

• Predominant types Electrical, Explosives, and Hazardous Substance Exposure decrease in review period

• Fire/Explosion increases from 9% in baseline to 20% in review period

• Emergence of Pressurized System and General Safety Problems

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Direct Causes of DX Personnel Safety Occurrences
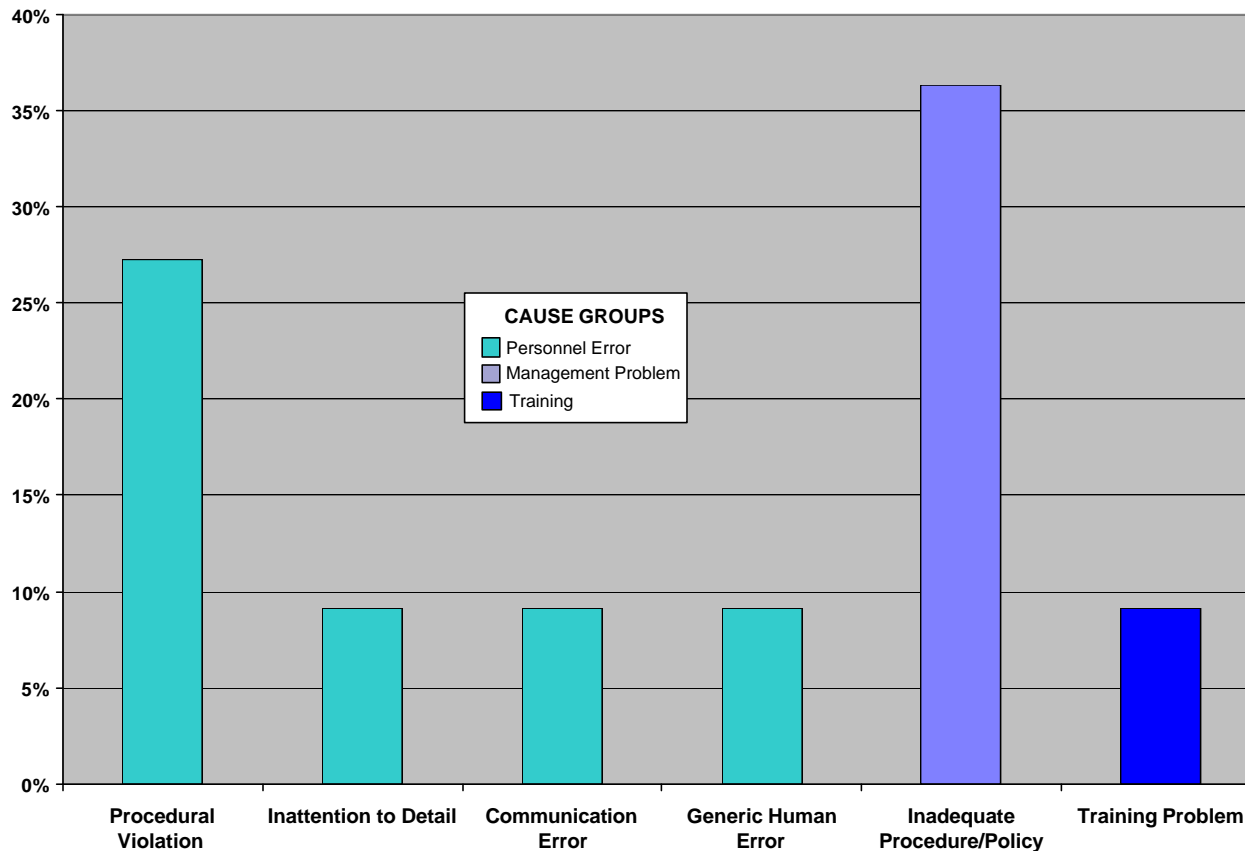
Direct Causes
Baseline and Review

• Personnel Error predominant type of direct cause for baseline and review periods—54% of total

• Inadequate Procedure/Policy accounts for 36% of total

• Training Problem accounts for 9% of total

Root Causes of DX Personnel Safety Occurrences

CAUSE GROUPS
- Management Problem
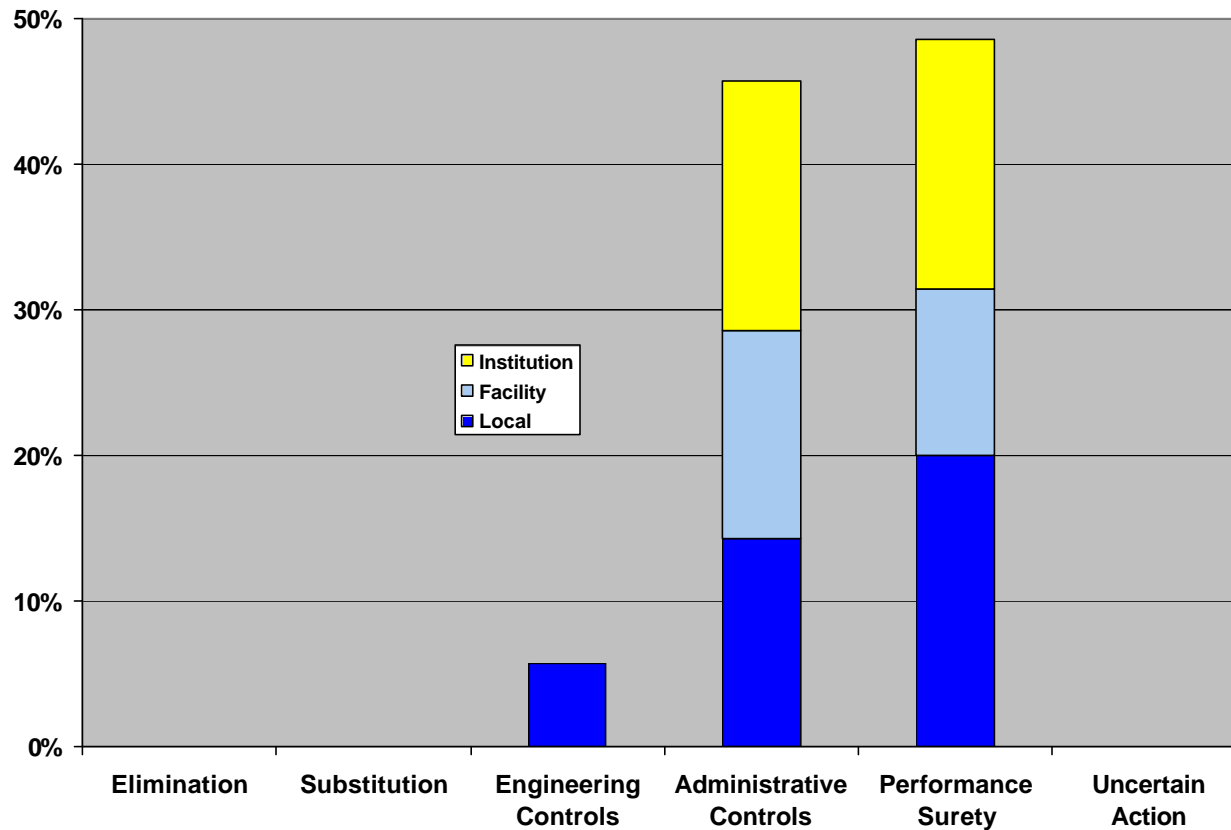- Personnel Error
- Training
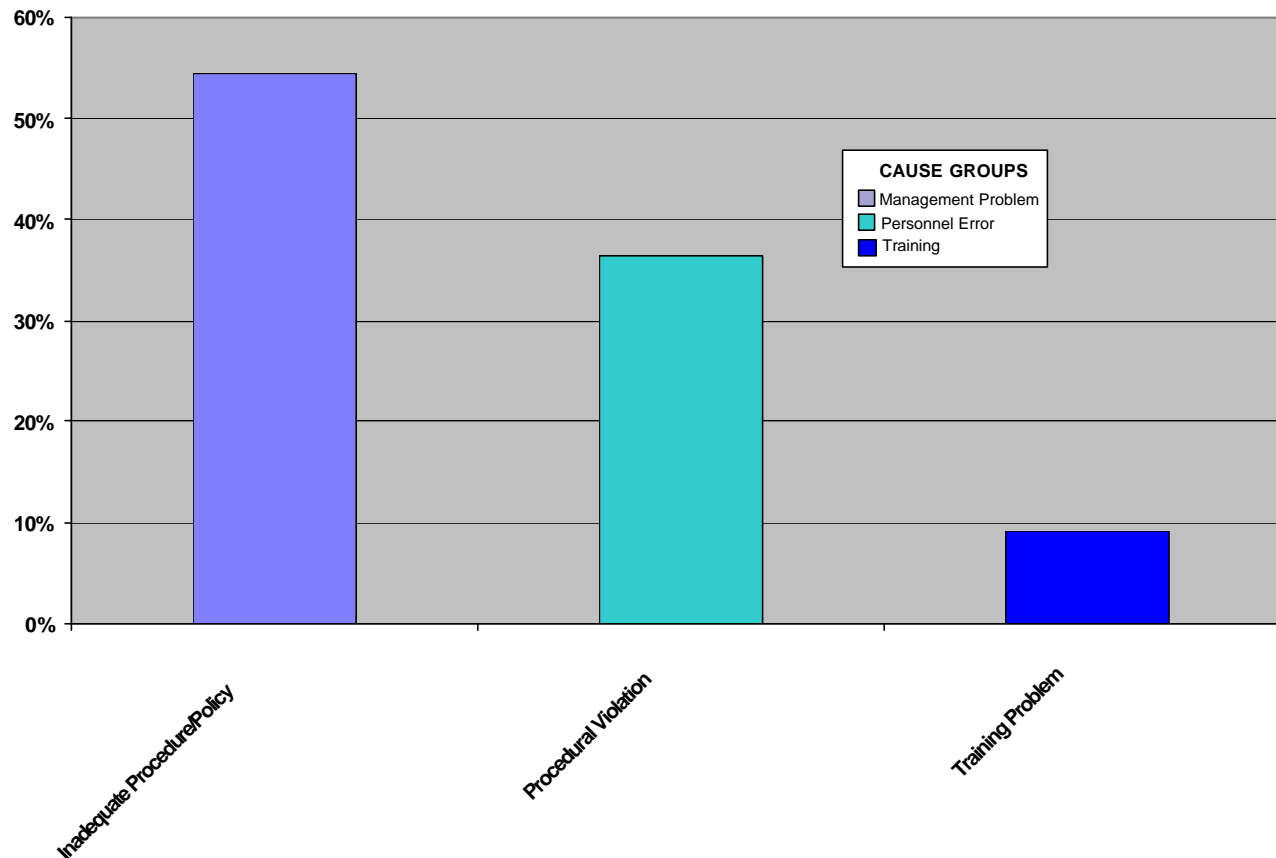
Root Causes
Baseline and Review

- Inadequate Procedure predominant root cause for baseline and review periods—55% of total
- Personnel Error identified as root cause in 36% of events
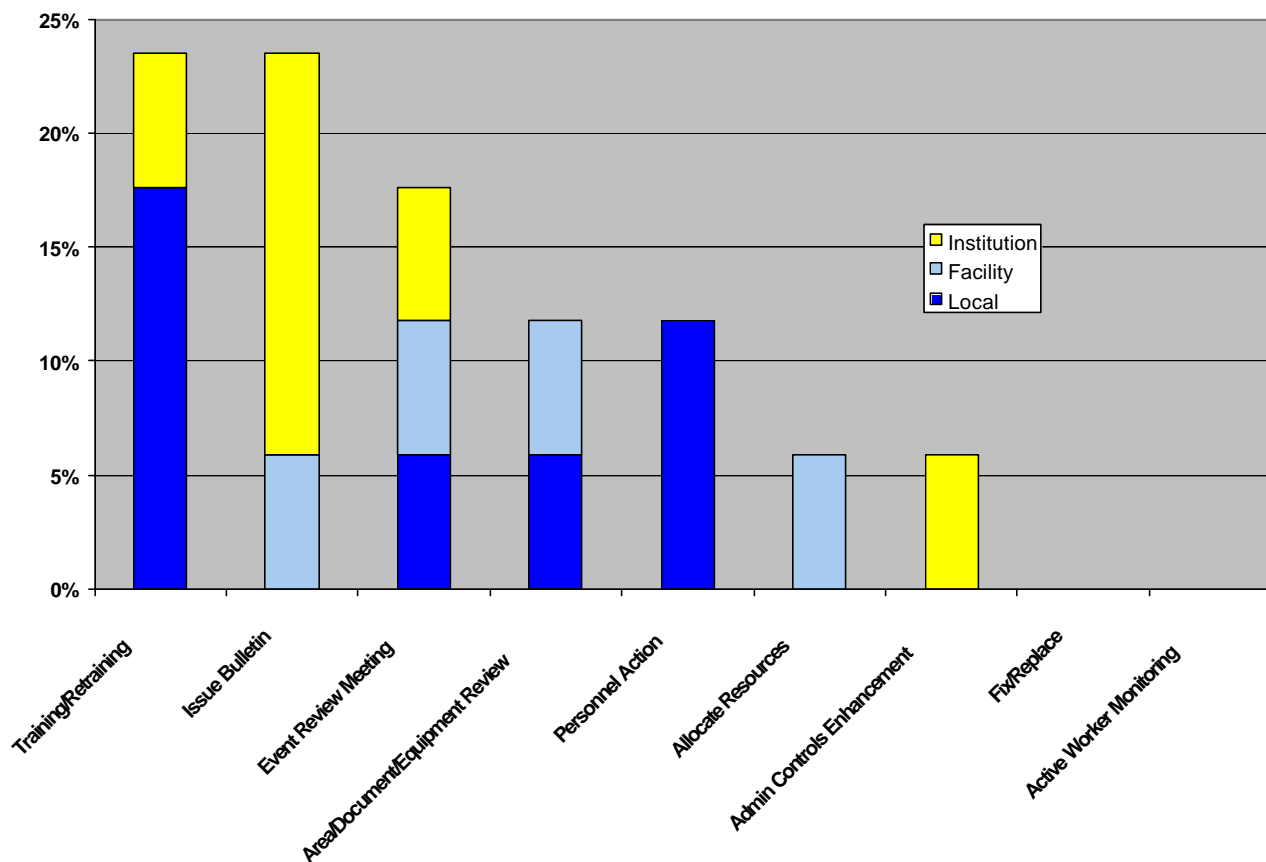- Training Problem identified in 9% of events

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Profile of DX Corrective Actions for Personnel Safety

Corrective Actions
(8/10/00 to 4/24/03)

• No actions target eliminating or substituting for lesser hazard
• About 6% of actions specify new or modified engineering barriers
• 34% of all actions targeted at institutional level
• Nearly 95% of all actions target procedural changes or "performance surety"—driven by causal pattern of inadequate procedures/ policies and planning problems

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

Chart categories: Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

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DX Performance Surety Actions for Personnel Safety

Performance Surety Actions
(8/10/00 to 4/24/03)

• Most performance surety actions involve reactive, one-time responses—document/equipment reviews, training sessions, equipment repairs, etc.

• No actions involve active monitoring of worker performance
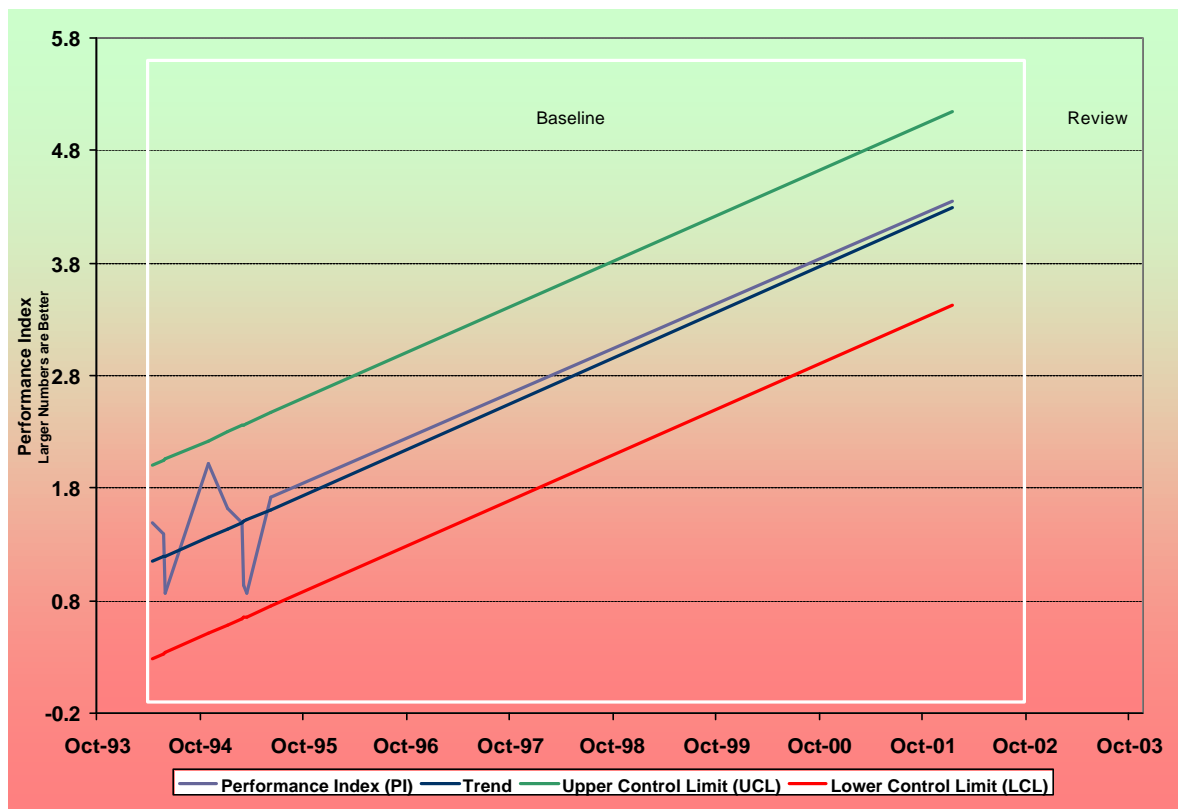
DX Environmental Occurrence Performance
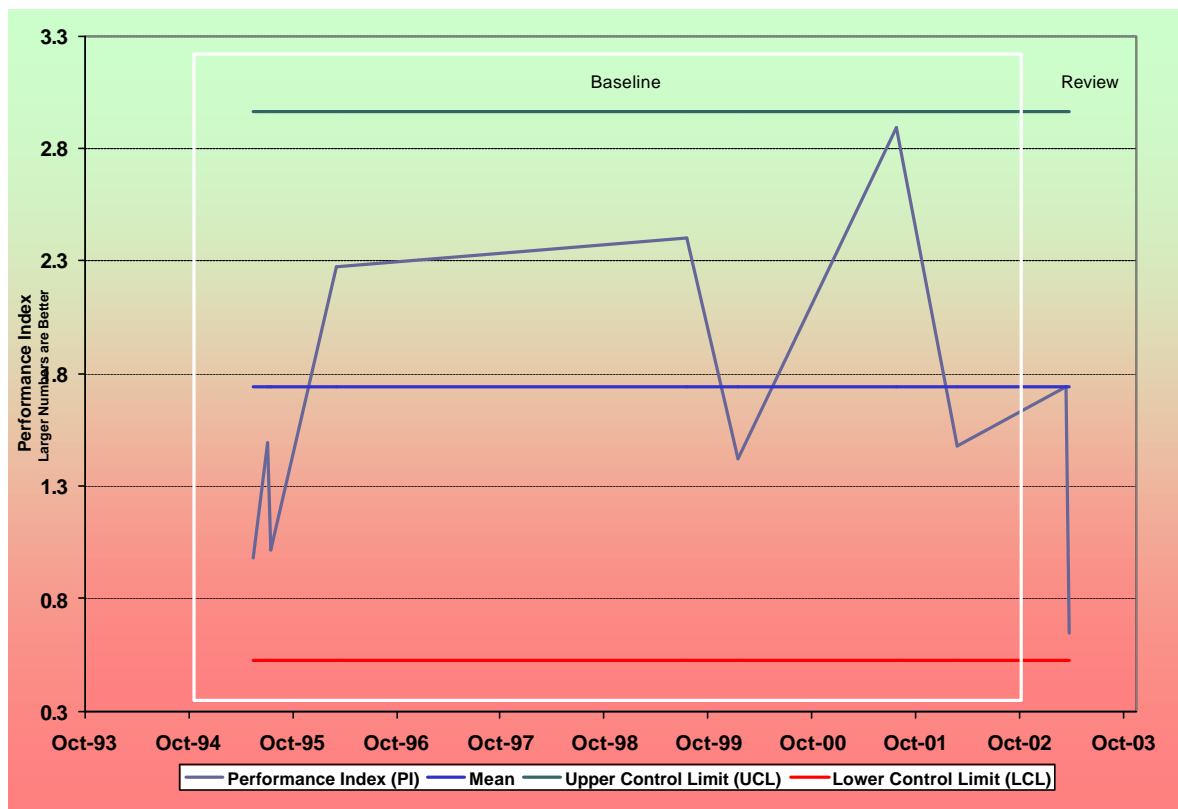
Environmental Control Chart
(1/94 to 4/24/03)

- 11 events severity weighted 2 or 3
  - Baseline: 9 events
  - Review: 2 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟥	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Los Alamos

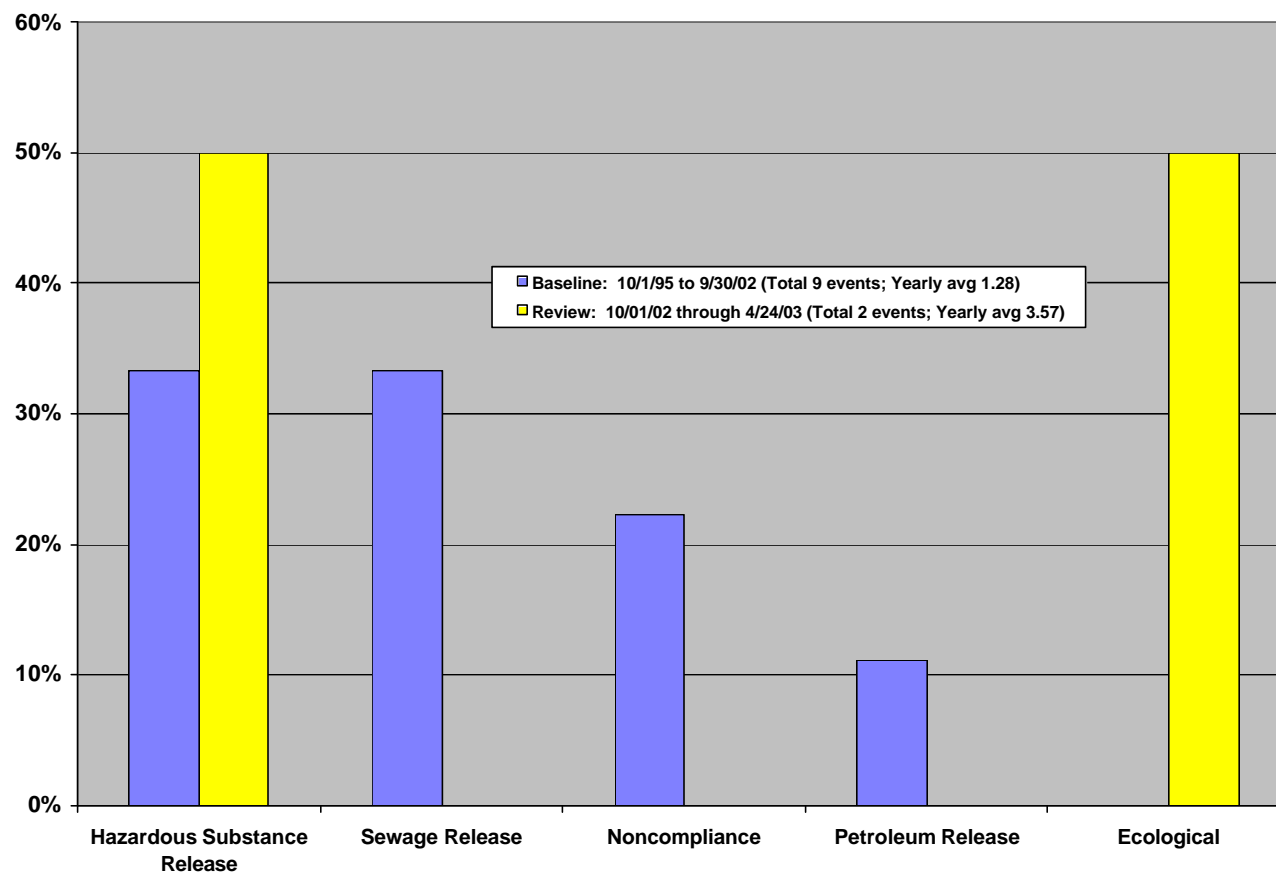# DX Radiological Protection Occurrence Performance

Radiological Protection Control Chart
(1/94 to 4/24/03)

- 11 events severity weighted 2 or 3
  - Baseline: 11 events
  - Review: 0 events

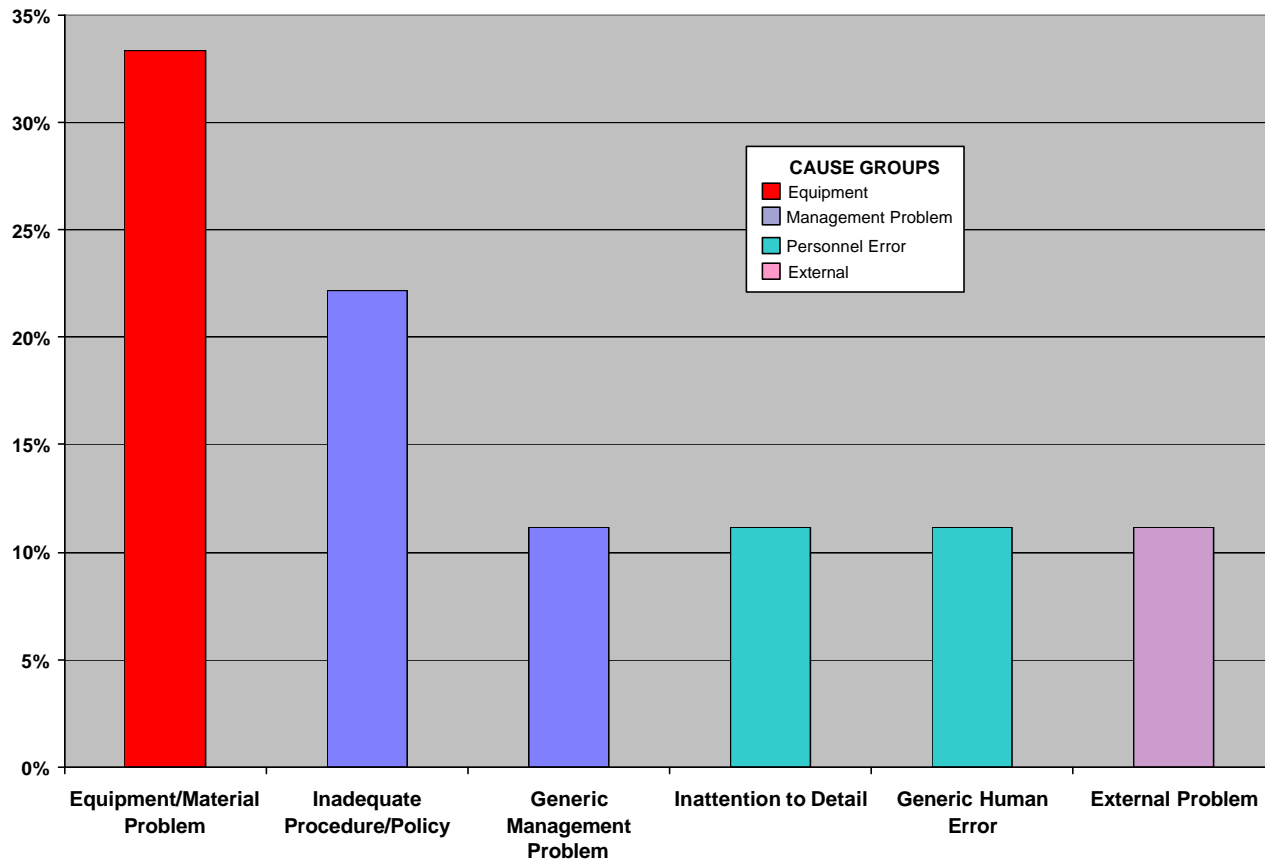| Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Los Alamos

Types of DX Environmental Occurrences

DX Environmental Occurrences by Type
Baseline vs. Review

• Predominant type Hazardous Substance Release increases from about 34% in baseline to 50% of review period (1 event)

• Emergence of Ecological type (1 event)
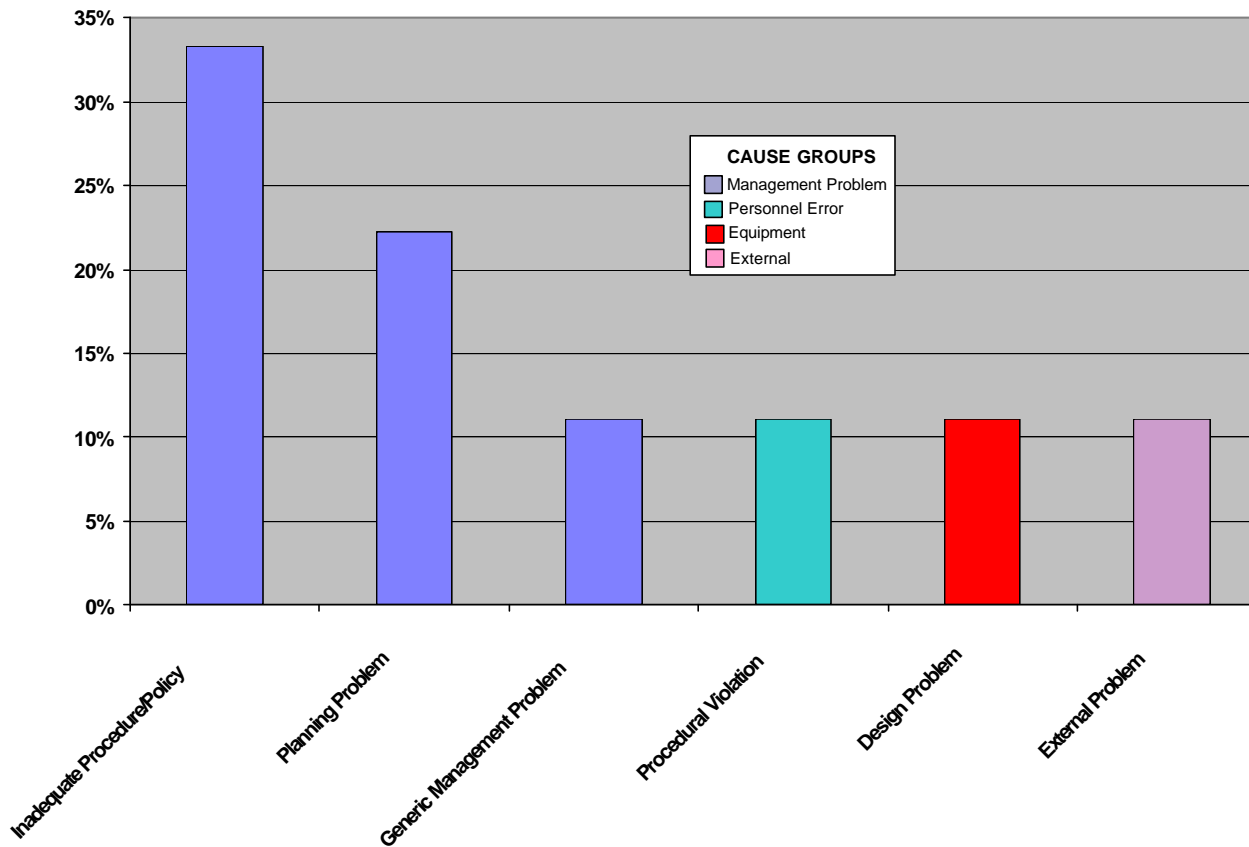
Baseline: 10/1/95 to 9/30/02 (Total 9 events; Yearly avg 1.28)
Review: 10/01/02 through 4/24/03 (Total 2 events; Yearly avg 3.57)

Hazardous Substance Release | Sewage Release | Noncompliance | Petroleum Release | Ecological

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Direct Causes of DX Environmental Occurrences

Direct Causes
Baseline and Review

• Equipment Problem identified as direct cause in about 33% of environmental occurrences
• Management Problem also identified in 33% of total
• Personnel Error accounts for 22% of direct causes
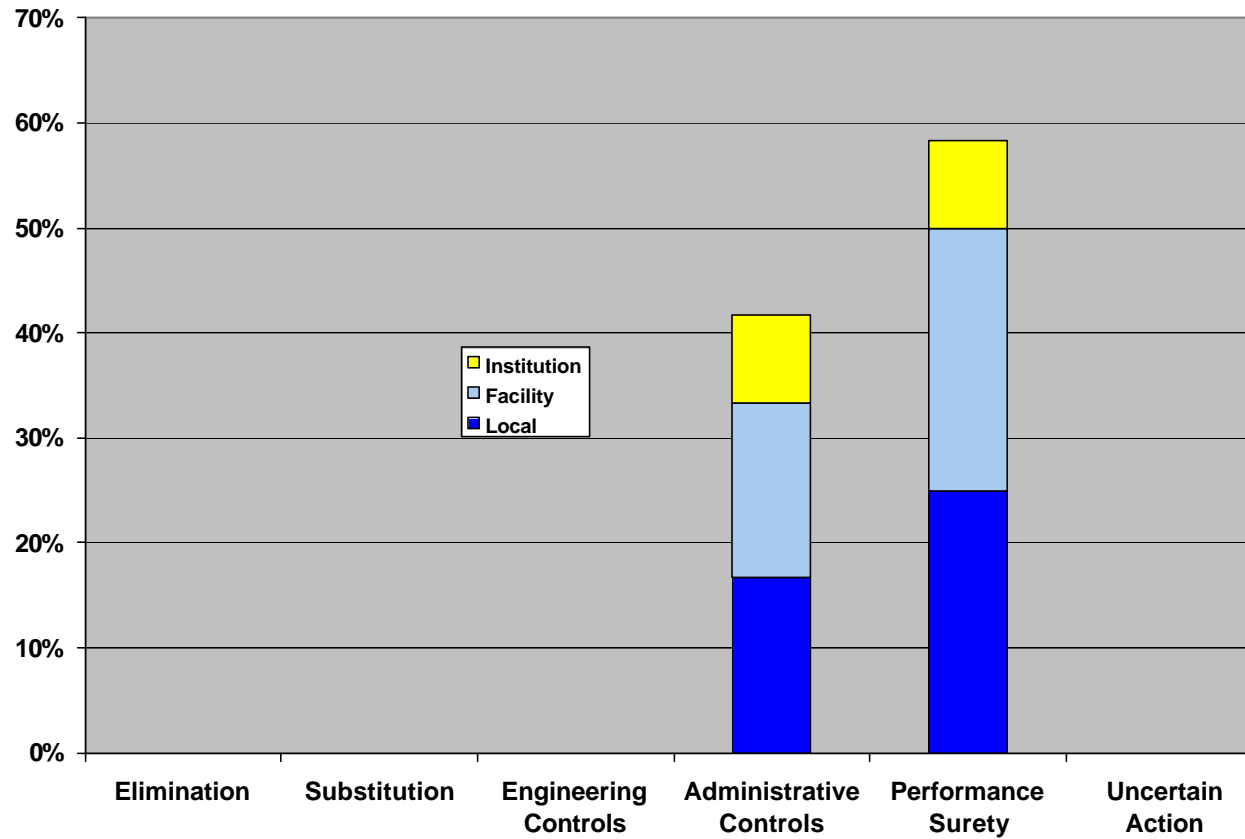
CAUSE GROUPS
- Equipment
- Management Problem
- Personnel Error
- External

Equipment/Material Problem · Inadequate Procedure/Policy · Generic Management Problem · Inattention to Detail · Generic Human Error · External Problem

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Root Causes of DX Environmental Occurrences

CAUSE GROUPS
- Management Problem
- Personnel Error
- Equipment
- External

Root Causes
Baseline and Review

- Management Problem identified as root cause in 66% of environmental occurrences
- Inadequate procedures primary type within Management Problem causal group
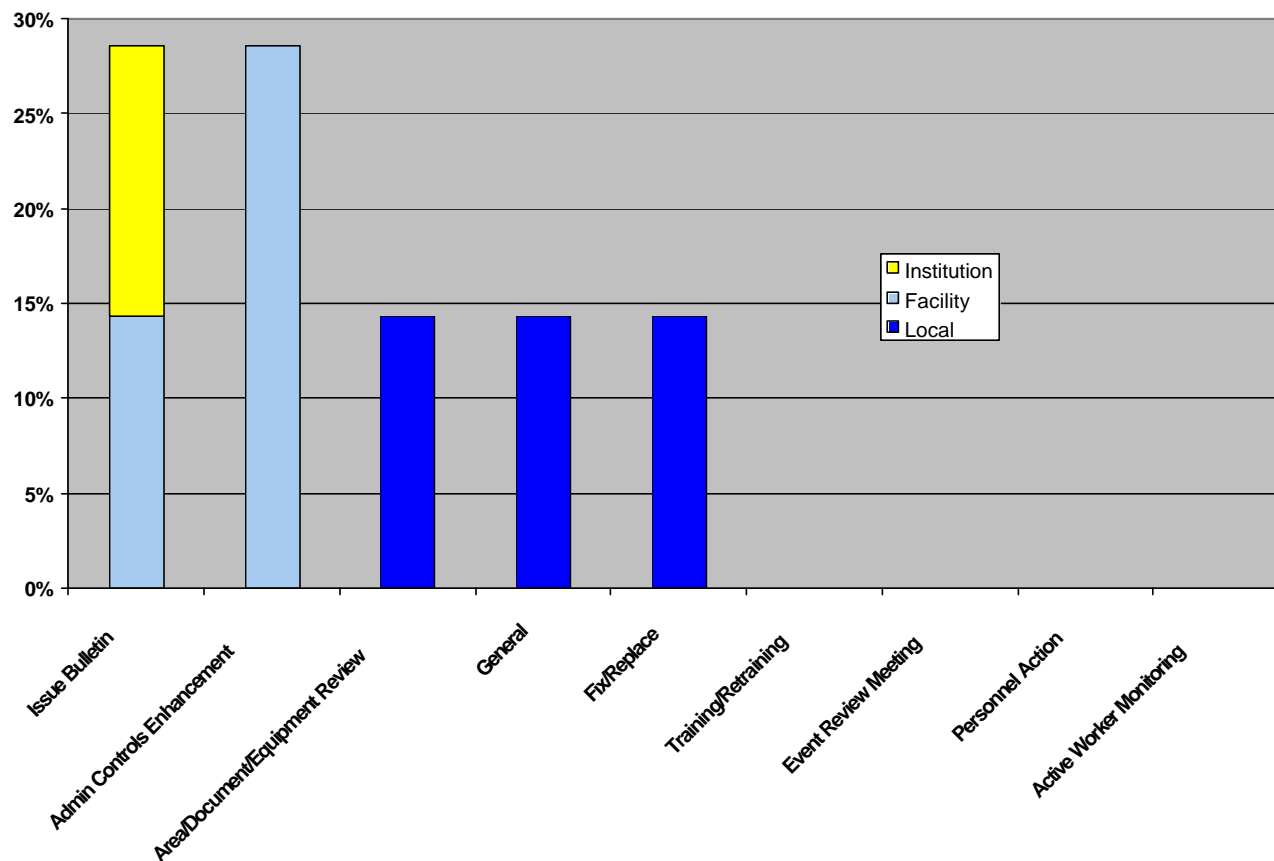
Chart categories (x-axis): Inadequate Procedure/Policy, Planning Problem, Generic Management Problem, Procedural Violation, Design Problem, External Problem

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Profile of DX Corrective Actions for Environmental Occurrences

Corrective Actions
(10/97 to 4/24/03)

• No actions target eliminating or substituting for lesser hazard
• No actions specify new or modified engineering barriers
• 17% of all actions targeted at institutional level
• 100% of all actions targeting procedural changes or "performance surety"

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

Chart categories (x-axis): Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

Chart y-axis: 0% to 70%

Los Alamos

DX Performance Surety Actions for Environmental Occurrences
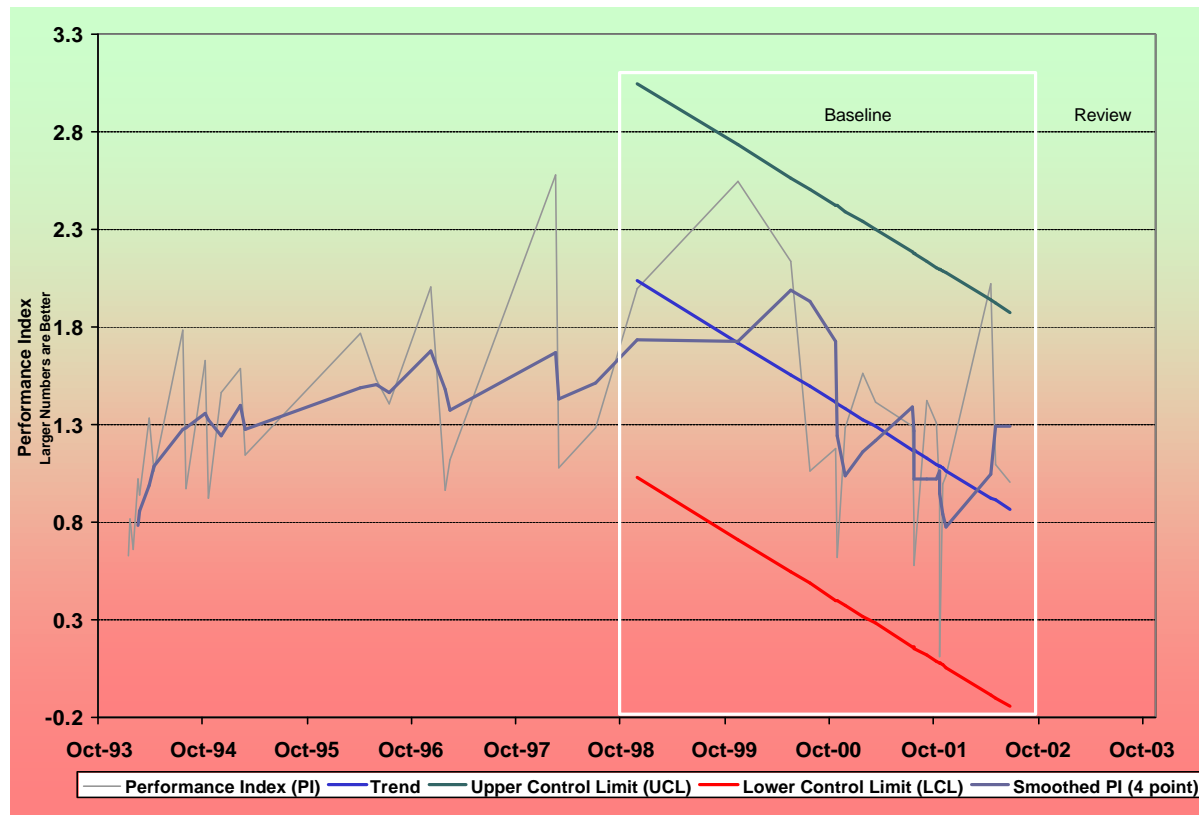

Performance Surety Actions
(10/97 to 4/24/03)

• Most performance surety actions involve administrative responses—bulletins, document/equipment reviews, enhancement of admin controls, etc.

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MST Division Occurrences

FY2003
(6 month)

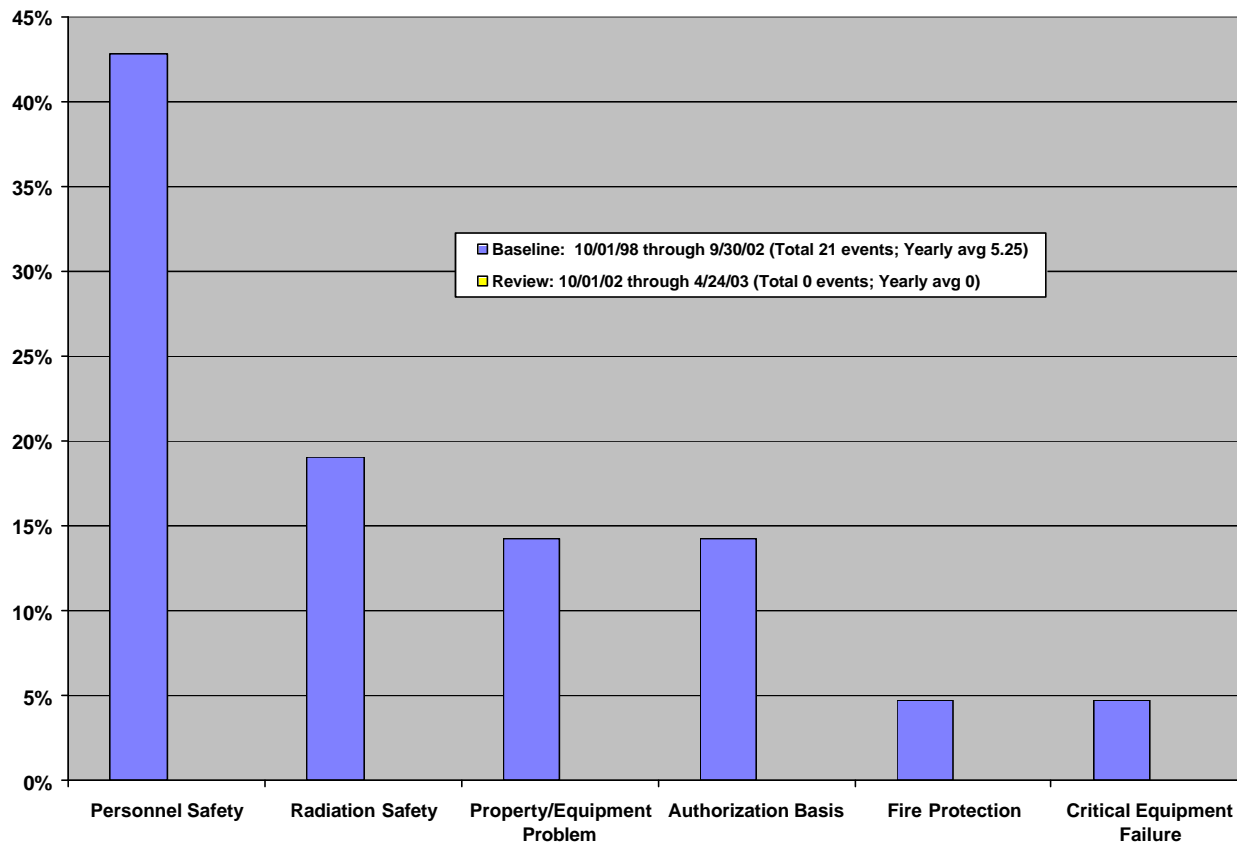Los Alamos

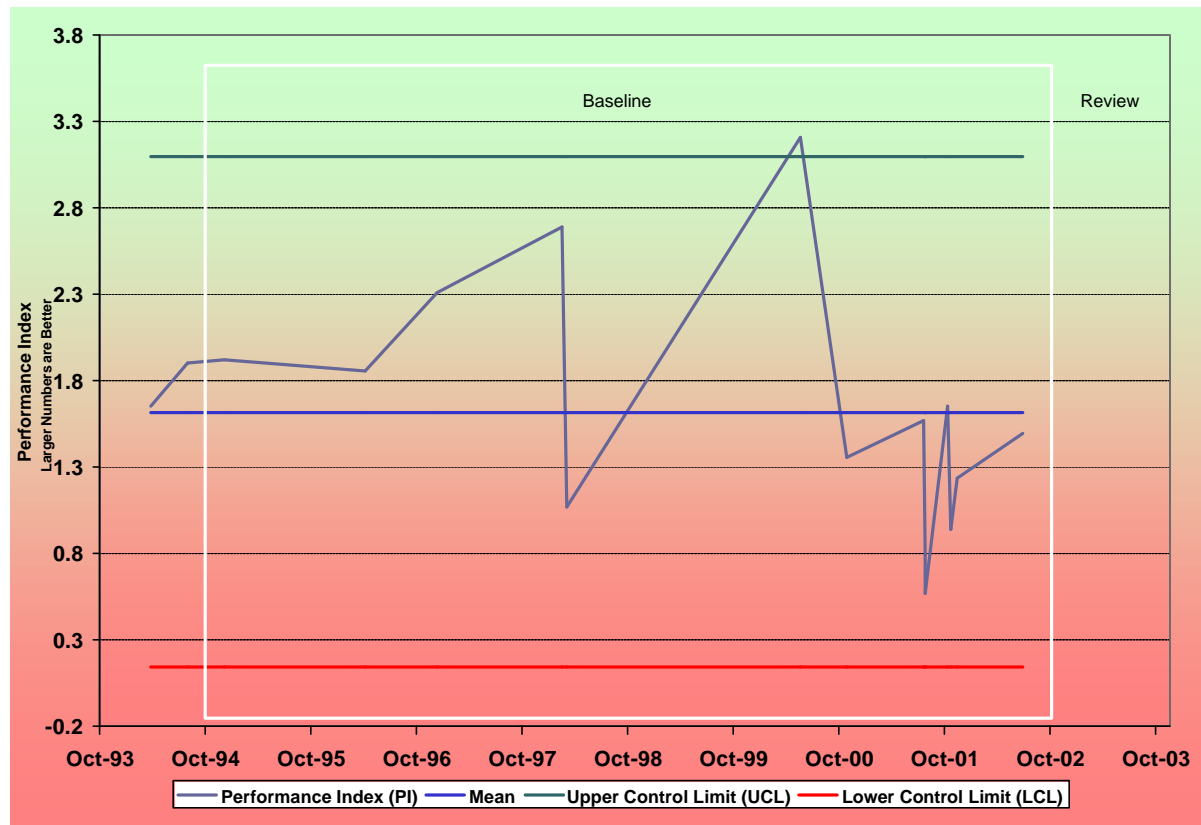# MST Occurrence Performance

MST PI Control Chart
(1/94 to 4/24/03)

- 45 events severity weighted 2 or 3
  - Pre-Baseline: 24 events
  - Baseline: 21 events
  - Review: 0 events

Review Period Score	
N/A	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
	Annualized Rate
N/A	Control Limit
	OVERALL SCORE

Type Distribution of MST Occurrences

Occurrences by Type
Baseline vs. Review

• Absence of any MST occurrences in review period

Chart legend:
- Baseline: 10/01/98 through 9/30/02 (Total 21 events; Yearly avg 5.25)
- Review: 10/01/02 through 4/24/03 (Total 0 events; Yearly avg 0)

Categories: Personnel Safety, Radiation Safety, Property/Equipment Problem, Authorization Basis, Fire Protection, Critical Equipment Failure

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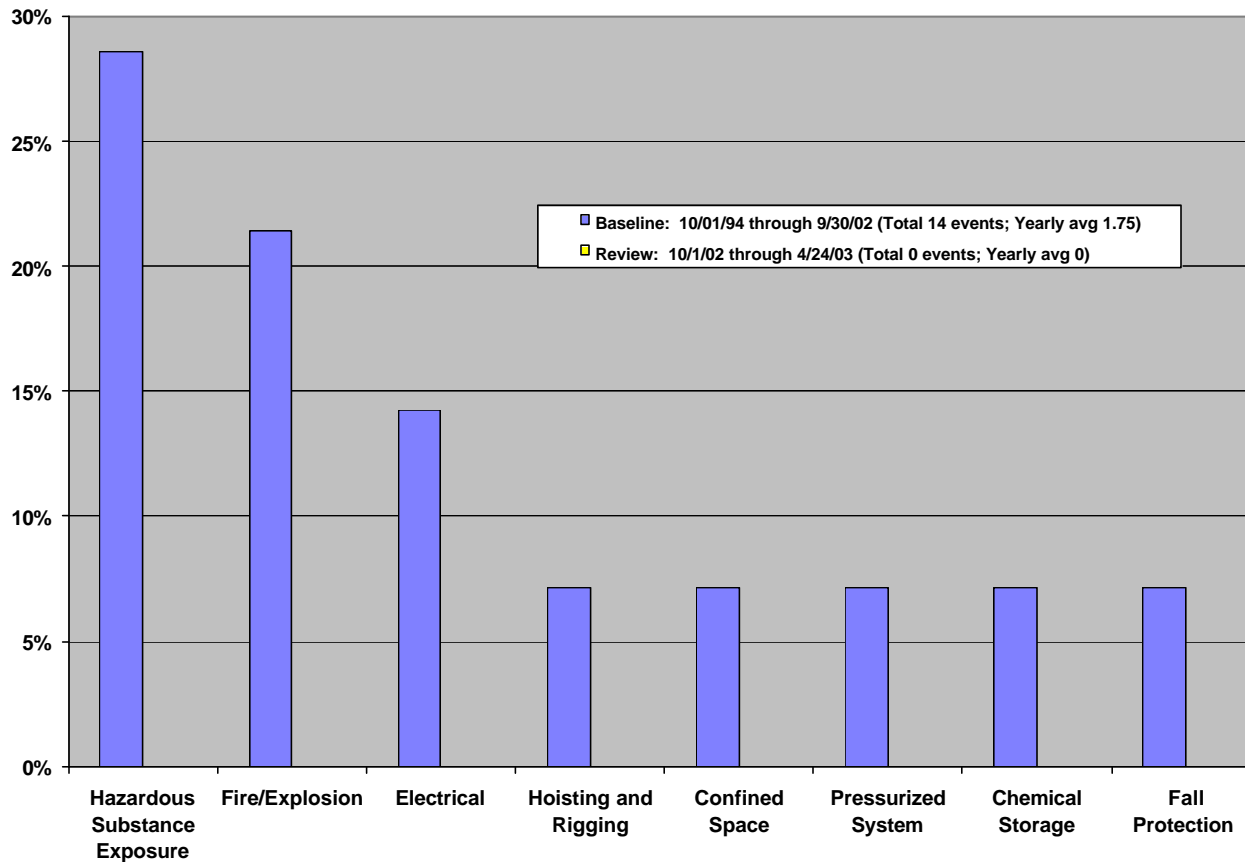# MST Personnel Safety Occurrence Performance

Personnel Safety Control Chart
(1/94 to 4/24/03)

- 17 events severity weighted 2 or 3
  - Pre-Baseline: 3 events
  - Baseline: 14 events
  - Review: 0 events

Review Period Score	
N/A	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
	Annualized Rate
N/A	Control Limit
	OVERALL SCORE

Types of MST Personnel Safety Occurrences

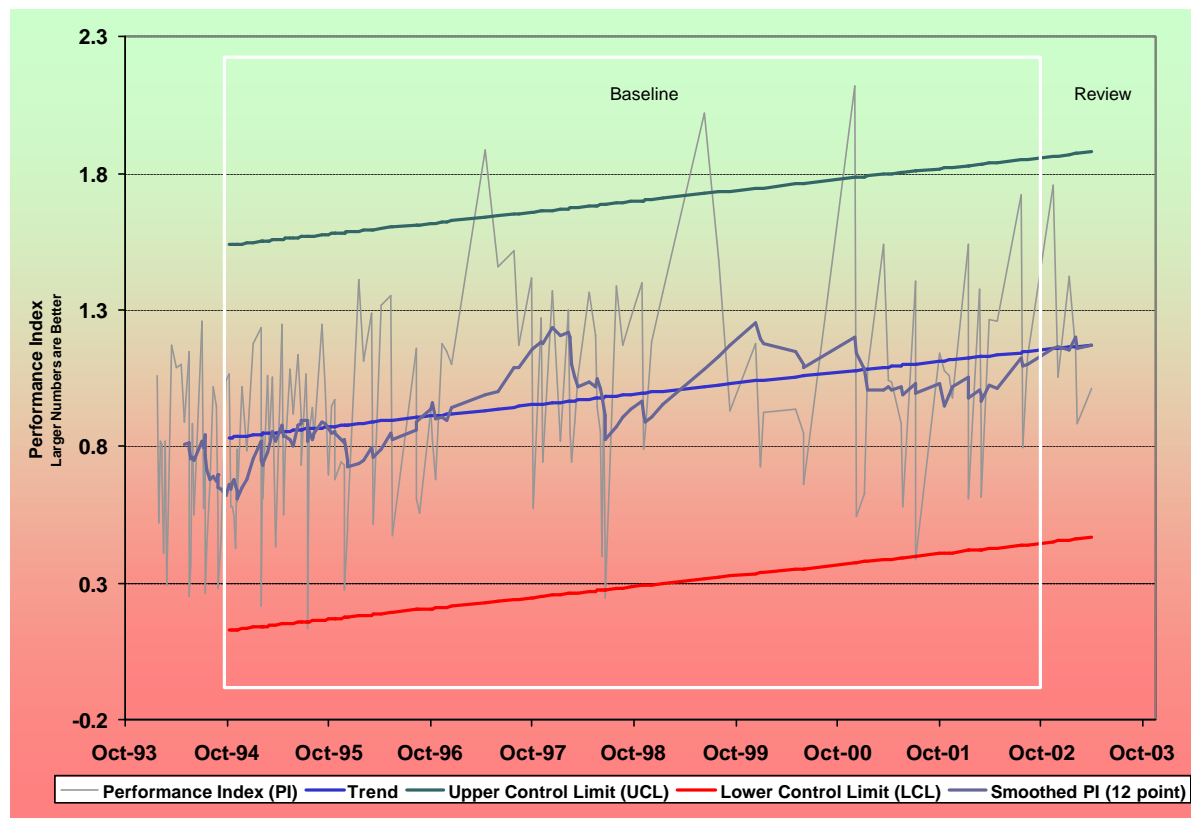**MST Personnel Safety Occurrences by Type**
Baseline vs. Review

• Absence of any MST Personnel Safety Events in review period

Legend from chart:
- Baseline: 10/01/94 through 9/30/02 (Total 14 events; Yearly avg 1.75)
- Review: 10/1/02 through 4/24/03 (Total 0 events; Yearly avg 0)

Chart categories:
- Hazardous Substance Exposure
- Fire/Explosion
- Electrical
- Hoisting and Rigging
- Confined Space
- Pressurized System
- Chemical Storage
- Fall Protection

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Small Division Occurrences

FY2003
(6 month)

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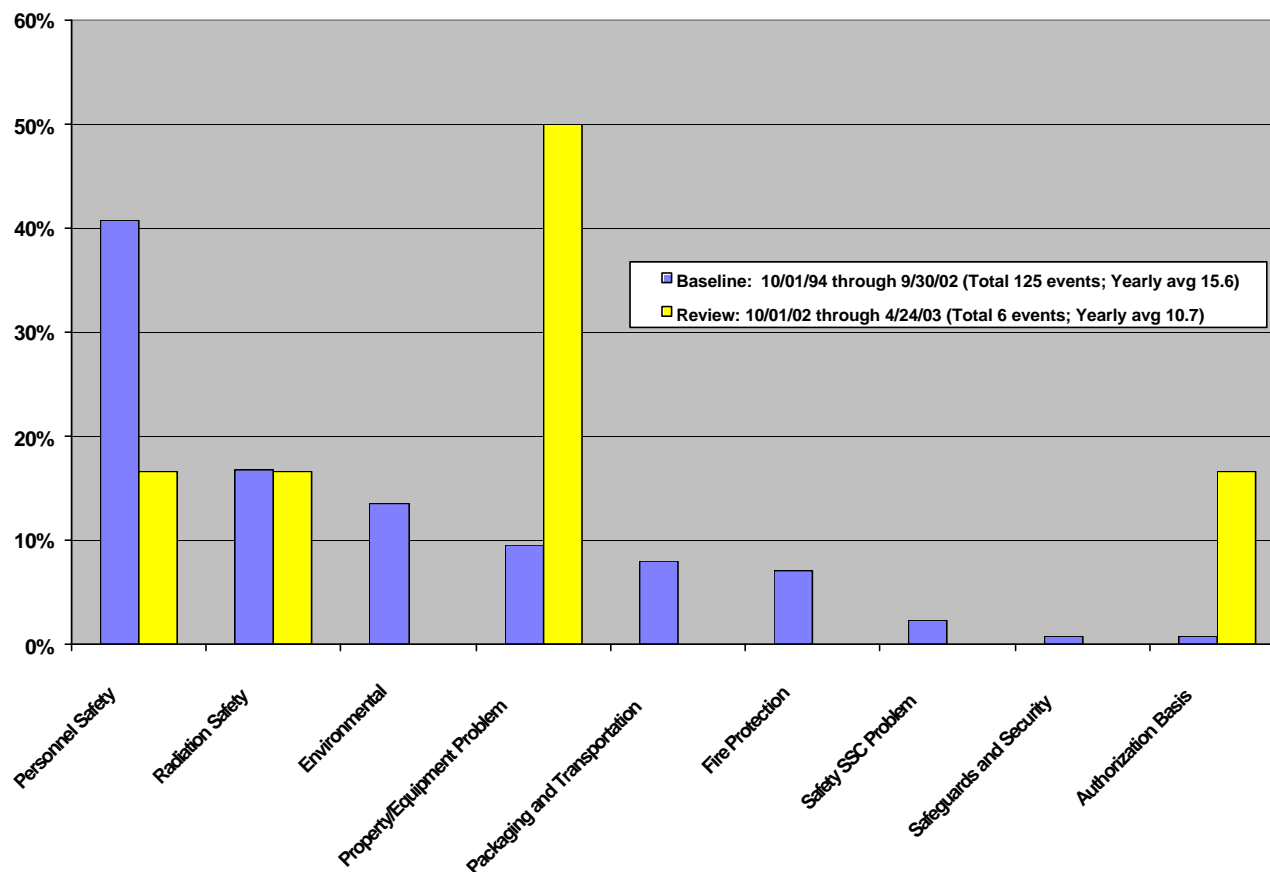# LANL Small Division Occurrence Performance

Small Division PI Control Chart
(1/94 to 4/24/03)

- 162 events severity weighted 2, 3, or 4
    - Pre-Baseline: 31 events
    - Baseline: 125 events
    - Review: 6 events

Review Period Score	
🟩	Sustained Performance
N/A	Review Period Trend
🟥	Over/Under Trend
🟩	Annualized Rate
N/A	Control Limit
🟨	OVERALL SCORE

Type Distribution of Small Division Occurrences

Occurrences by Type
Baseline vs. Review

Legend:
- Baseline: 10/01/94 through 9/30/02 (Total 125 events; Yearly avg 15.6)
- Review: 10/01/02 through 4/24/03 (Total 6 events; Yearly avg 10.7)

Categories: Personnel Safety, Radiation Safety, Environmental, Property/Equipment Problem, Packaging and Transportation, Fire Protection, Safety SSC Problem, Safeguards and Security, Authorization Basis

• Predominant type Personnel Safety decreases from 41% in baseline to 17% in review period

• Radiation Safety maintains 17% of baseline and review

• Property/Equipment increases from 10% to 50%

• Authorization Basis increases from 1% to 17%

• Absence of other types

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Small Division Personnel Safety Occurrence Performance
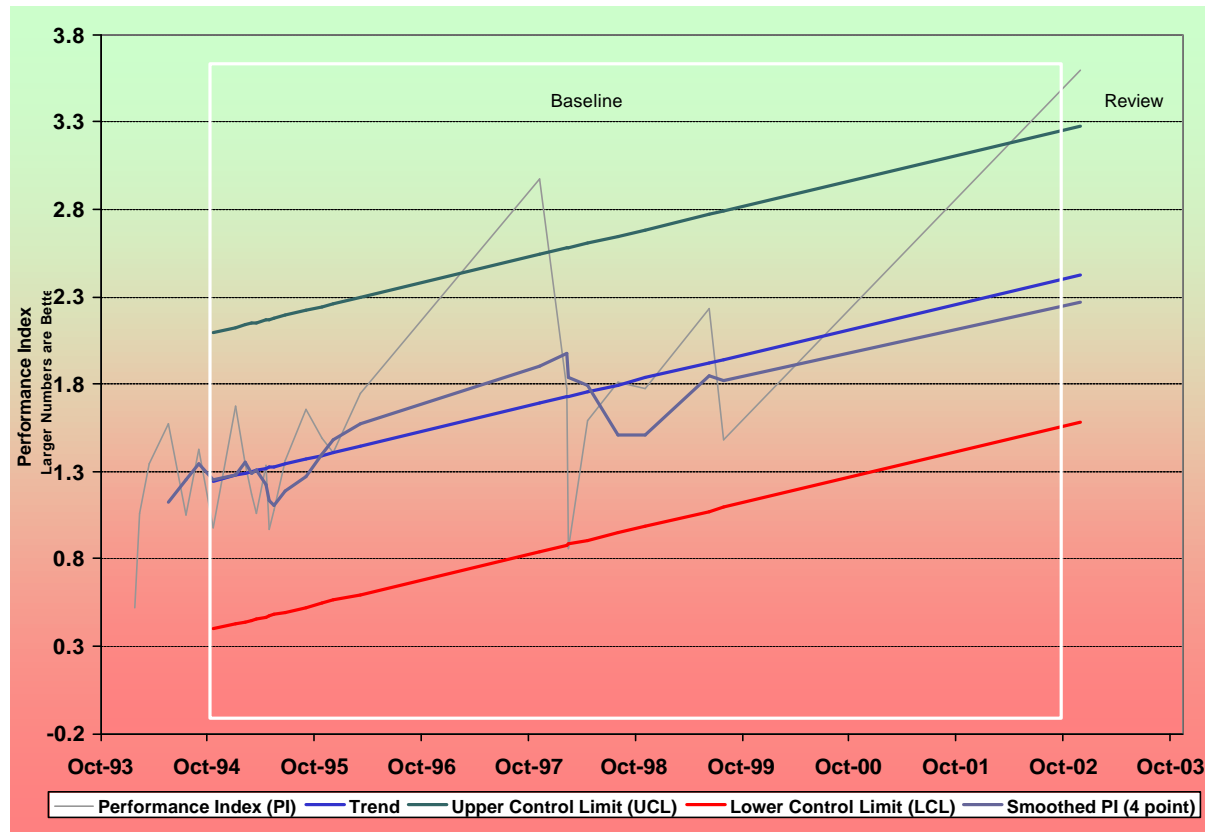

Personnel Safety Control Chart
(1/94 to 4/24/03)

- 58 events severity weighted 2, 3 or 4
  - Pre-Baseline: 5 events
  - Baseline: 52 events
  - Review: 1 event

Review Period Score	
■	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
■	**Annualized Rate**
N/A	**Control Limit**
■	**OVERALL SCORE**

Chart legend: Performance Index (PI) — Trend — Upper Control Limit (UCL) — Lower Control Limit (LCL) — Smoothed PI (6 point)

# Small Division Radiological Protection Occurrence Performance

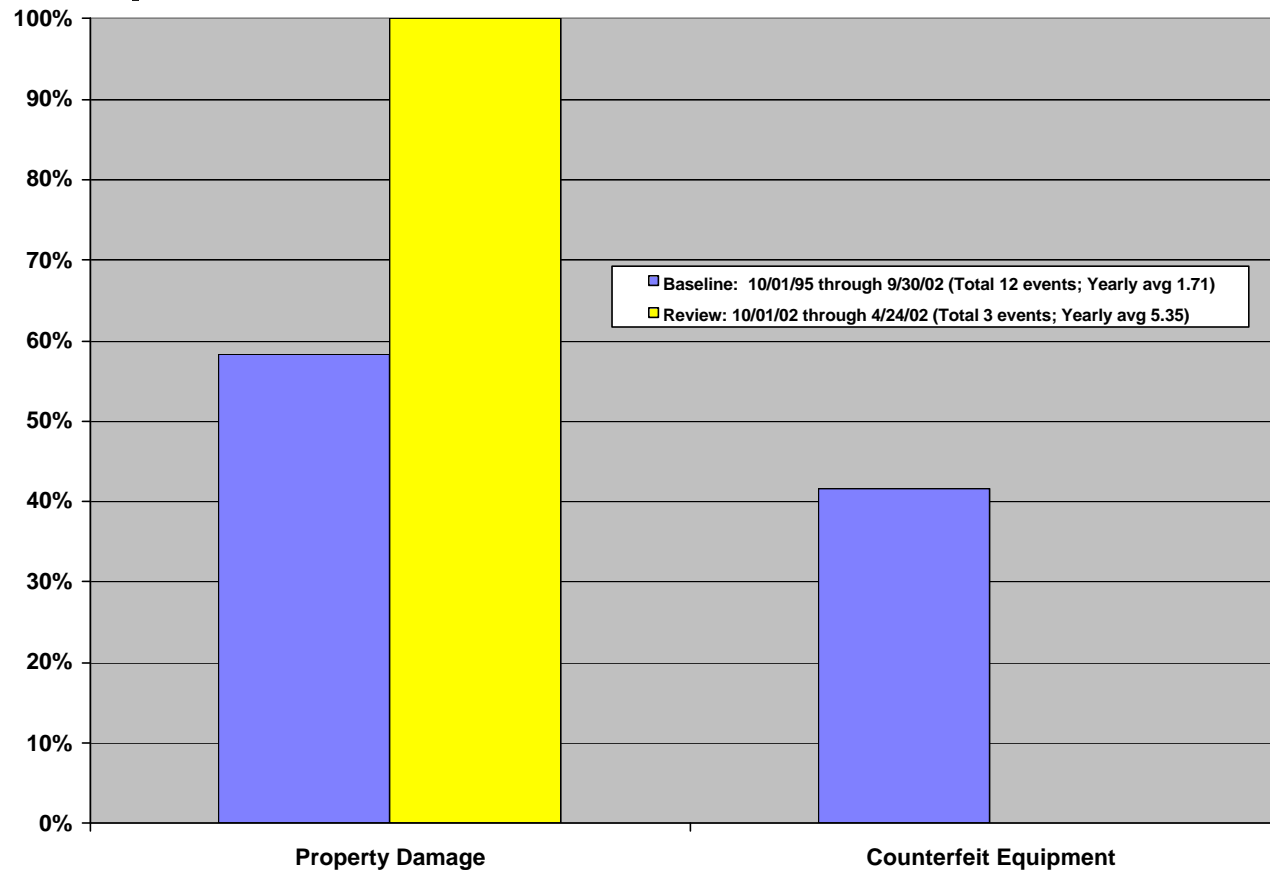Radiological Protection Control Chart
(1/94 to 4/24/03)

- 29 events severity weighted 2 or 3
  - Pre-Baseline: 7 events
  - Baseline: 21 events
  - Review: 1 event

Review Period Score	
🟩	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟩	Annualized Rate
🟩	Control Limit
🟩	OVERALL SCORE

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Small Division Environmental Occurrence Performance
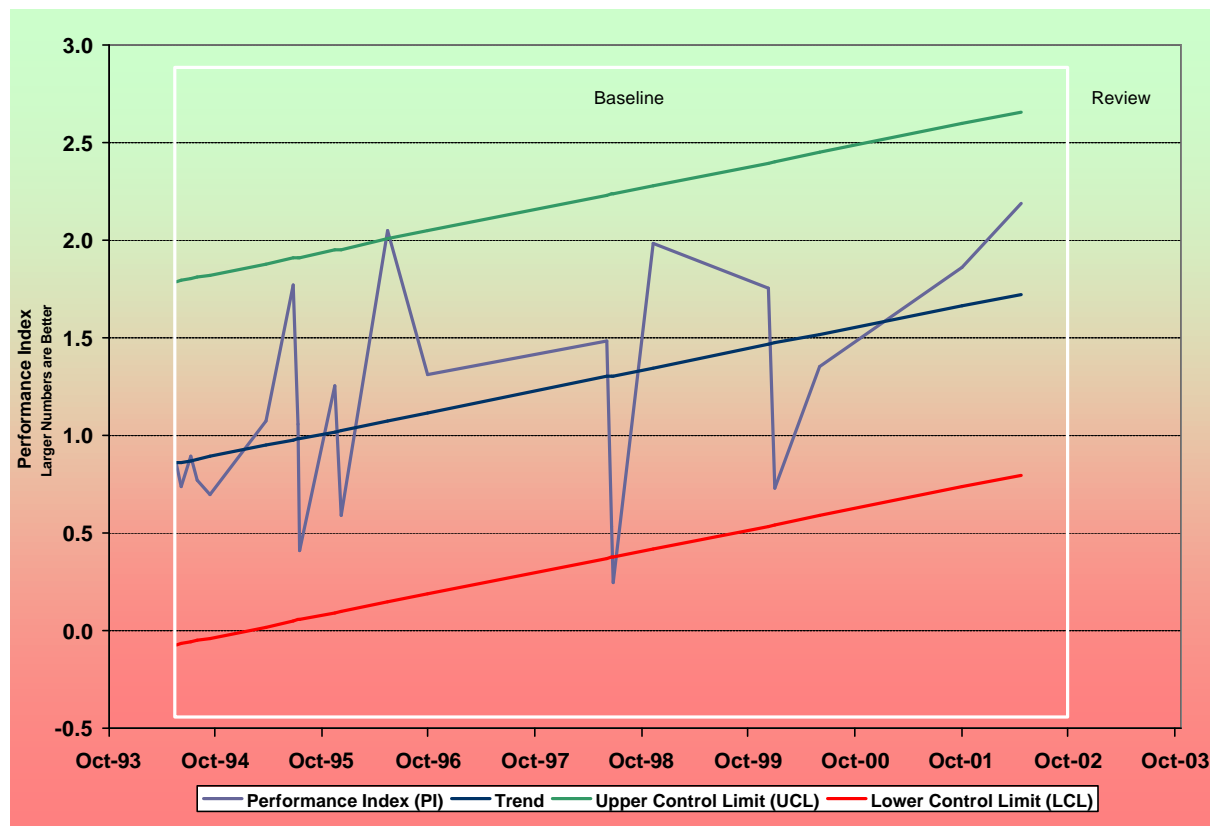
Environmental Control Chart
(1/94 to 4/24/03)

- 23 events severity weighted 2, 3, or 4
  - Baseline: 23 events
  - Review: 0 events

Review Period Score	
N/A	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
(green)	**Annualized Rate**
N/A	**Control Limit**
(green)	**OVERALL SCORE**

Small Division Property/Equipment Problems Occurrence Performance
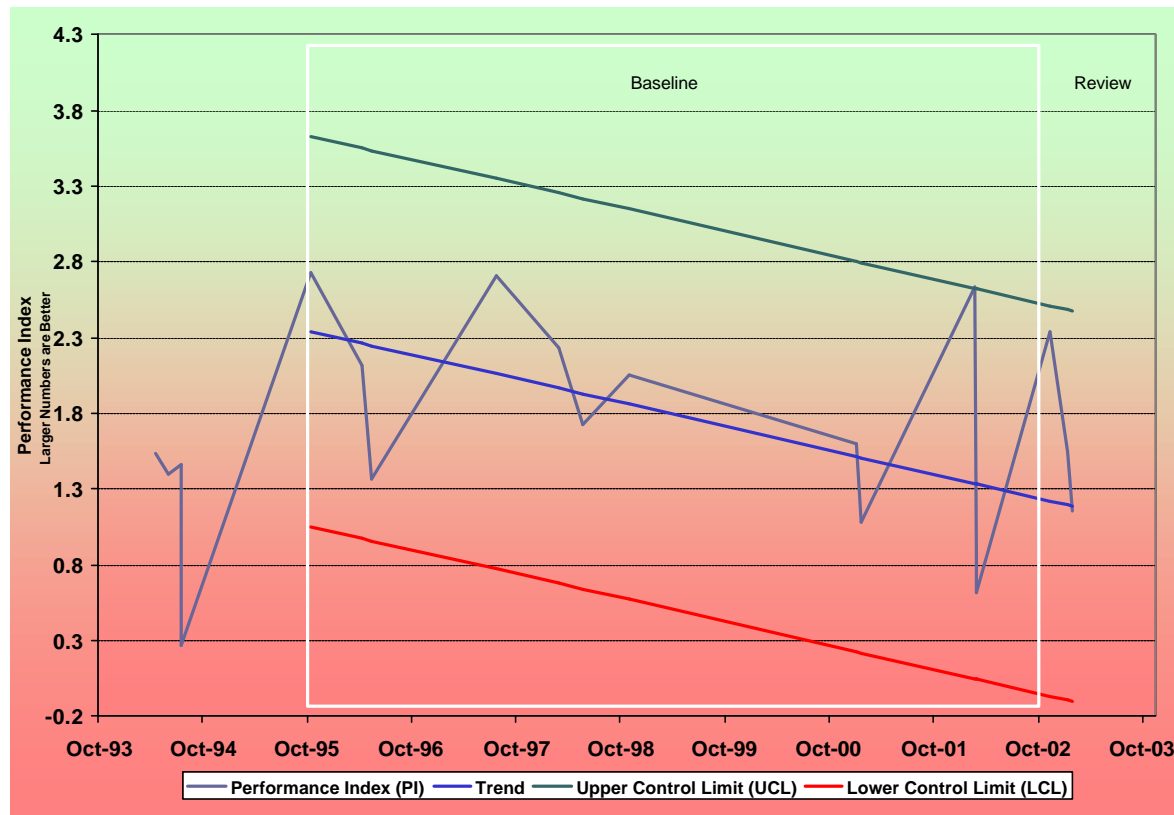
Property/Equipment Problems Control Chart (1/94 to 4/24/03)

- 20 events severity weighted 2 or 4
  - Pre-Baseline: 5 events
  - Baseline: 12 events
  - Review: 3 events

Review Period Score	
🟥	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟥	**Annualized Rate**
N/A	**Control Limit**
🟥	**OVERALL SCORE**

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Types of Small Division Property/Equipment Occurrences

Property/Equipment Occurrences by Type
Baseline vs. Review

• Property Damage increases from 58% of baseline to 100% of review period (3 events)

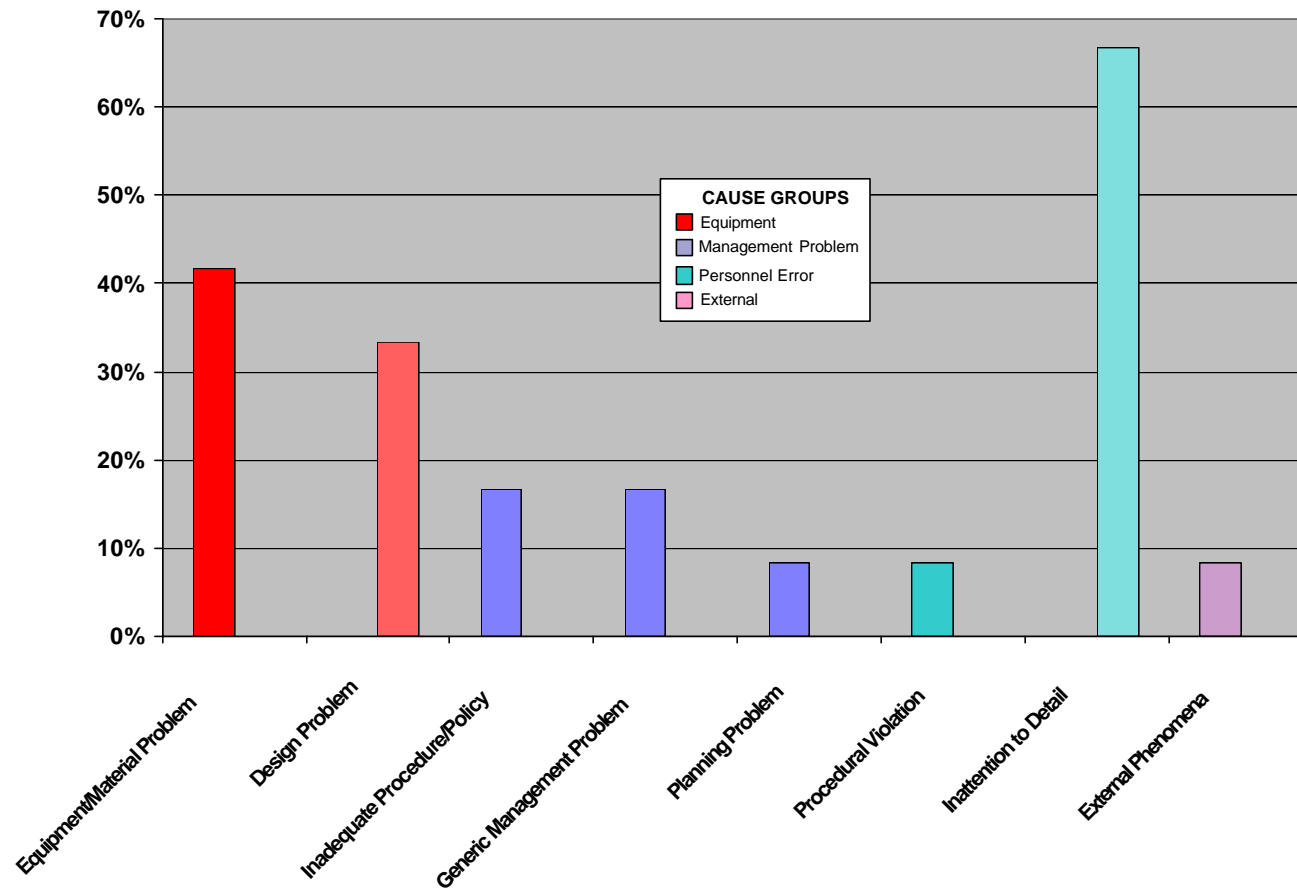• Disappearance of Counterfeit Equipment occurrences in review period

Legend from chart:
- Baseline: 10/01/95 through 9/30/02 (Total 12 events; Yearly avg 1.71)
- Review: 10/01/02 through 4/24/02 (Total 3 events; Yearly avg 5.35)

Chart axes: 0% to 100% vertical; categories: Property Damage, Counterfeit Equipment

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Direct Causes of Small Division Property/Equipment Problems
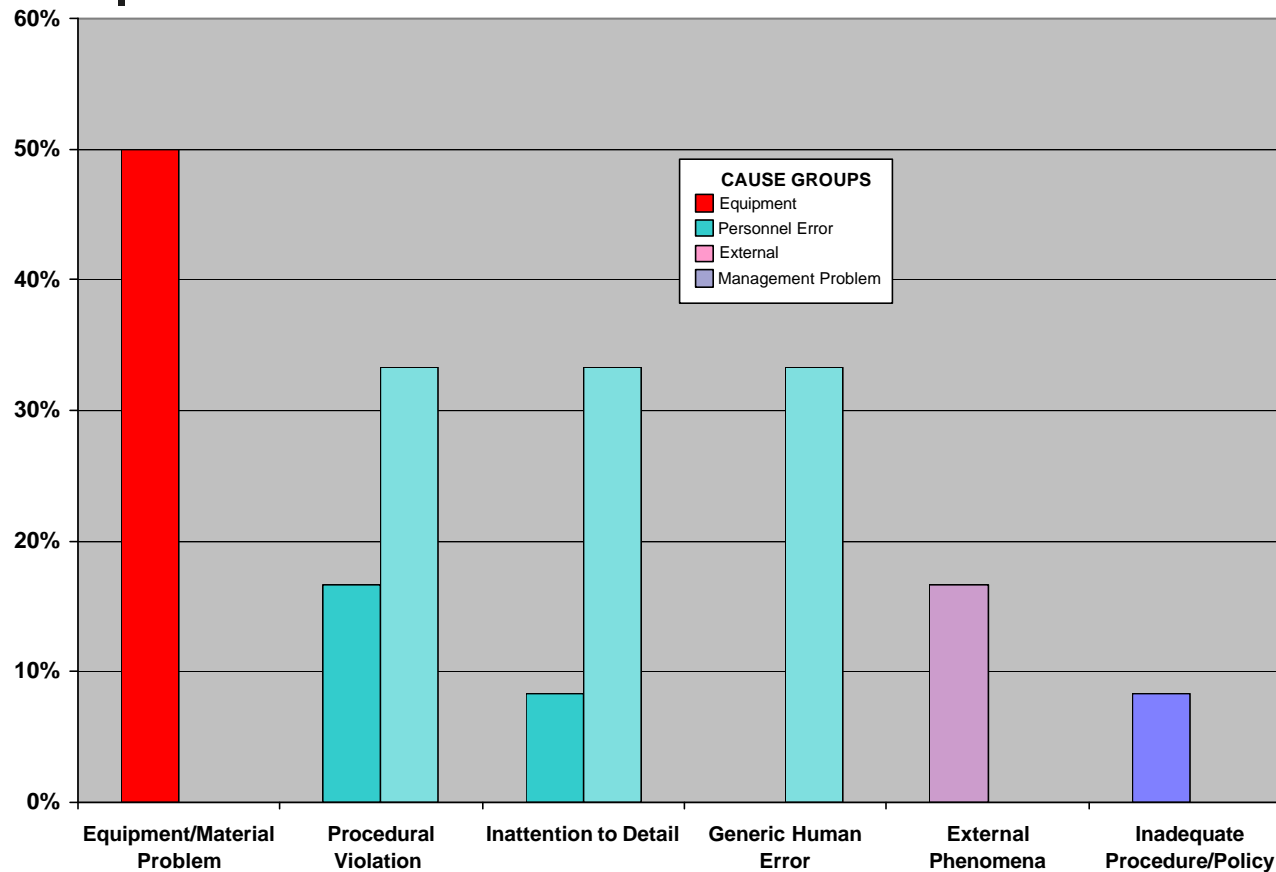
Direct Causes
Baseline vs. Review

- Disappearance of predominant direct cause Equipment Problem in review period
- Personnel Error increases from 25% of baseline to 100% of review period

CAUSE GROUPS
- Equipment
- Personnel Error
- External
- Management Problem

Chart categories (x-axis): Equipment/Material Problem, Procedural Violation, Inattention to Detail, Generic Human Error, External Phenomena, Inadequate Procedure/Policy

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Root Causes of Small Division Property/Equipment Problems

Root Causes
Baseline vs. Review

• Equipment failure decreases from 42% of baseline to 33% of review period
• Absence of Management Problem as root cause in review period
• Personnel Error increases from 8% to 67% in review period

Profile of Corrective Actions for Small Division Property/Equipment Problems
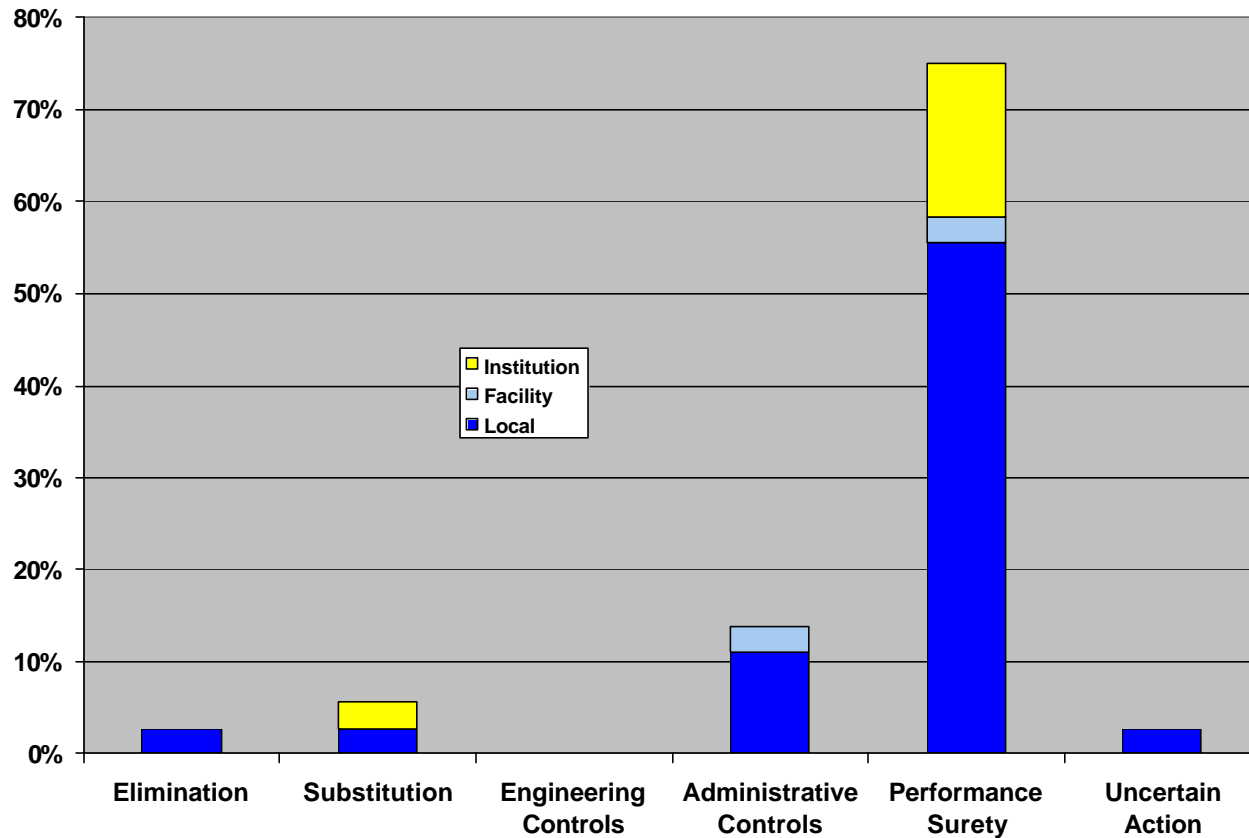
Corrective Actions
(10/97 to 4/24/03)

- About 9% of actions target eliminating or substituting for lesser hazard
- No actions specify new or modified engineering barriers
- 19% of actions targeted at institutional level
- About 75% of all actions target "performance surety" actions

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Performance Surety Actions for Small Division Property/Equipment Problems
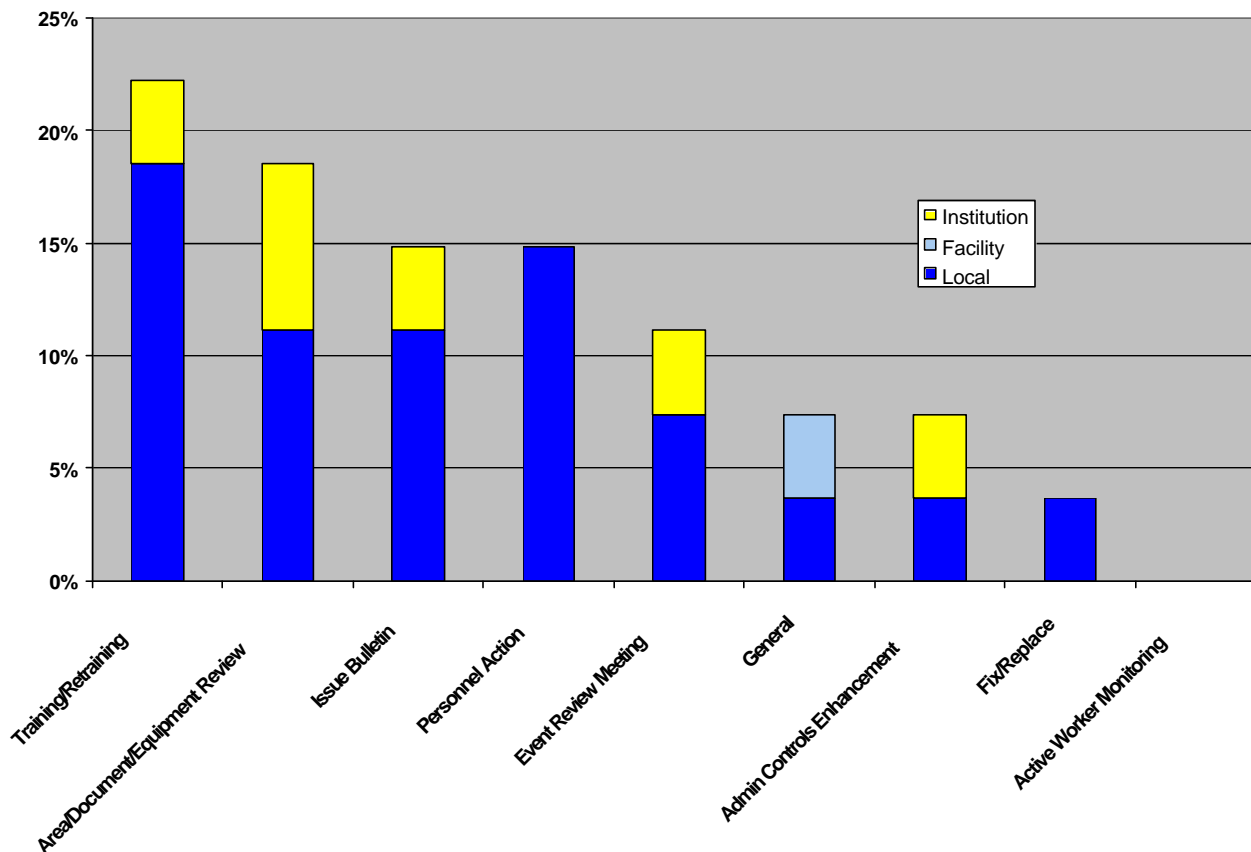
Performance Surety Actions
(10/97 to 4/24/03)

• Most performance surety actions involve local or facility response to Property/Equipment problems—training, document or equipment reviews, issuance of bulletins, and personnel actions
• 22% of performance surety actions targeted at institutional level
• No actions targeted at active worker monitoring
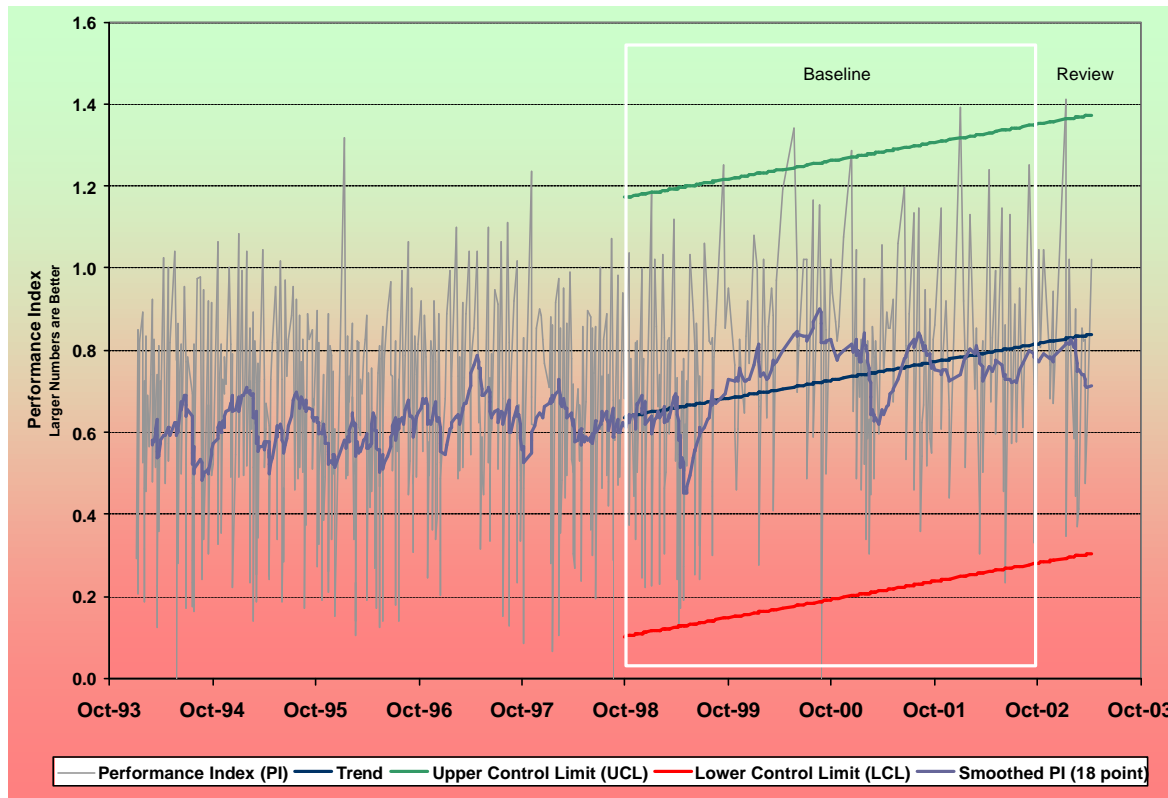
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LANL Safety Function Review

FY2003

(6 month)

Los Alamos

Radiological Protection Occurrences

FY2003
(6 month)

Los Alamos

LANL Radiological Protection Occurrence Performance*

Radiological Protection PI Control Chart
(1/94 to 4/24/03)

- 664 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 426 events
  - Baseline: 214 events
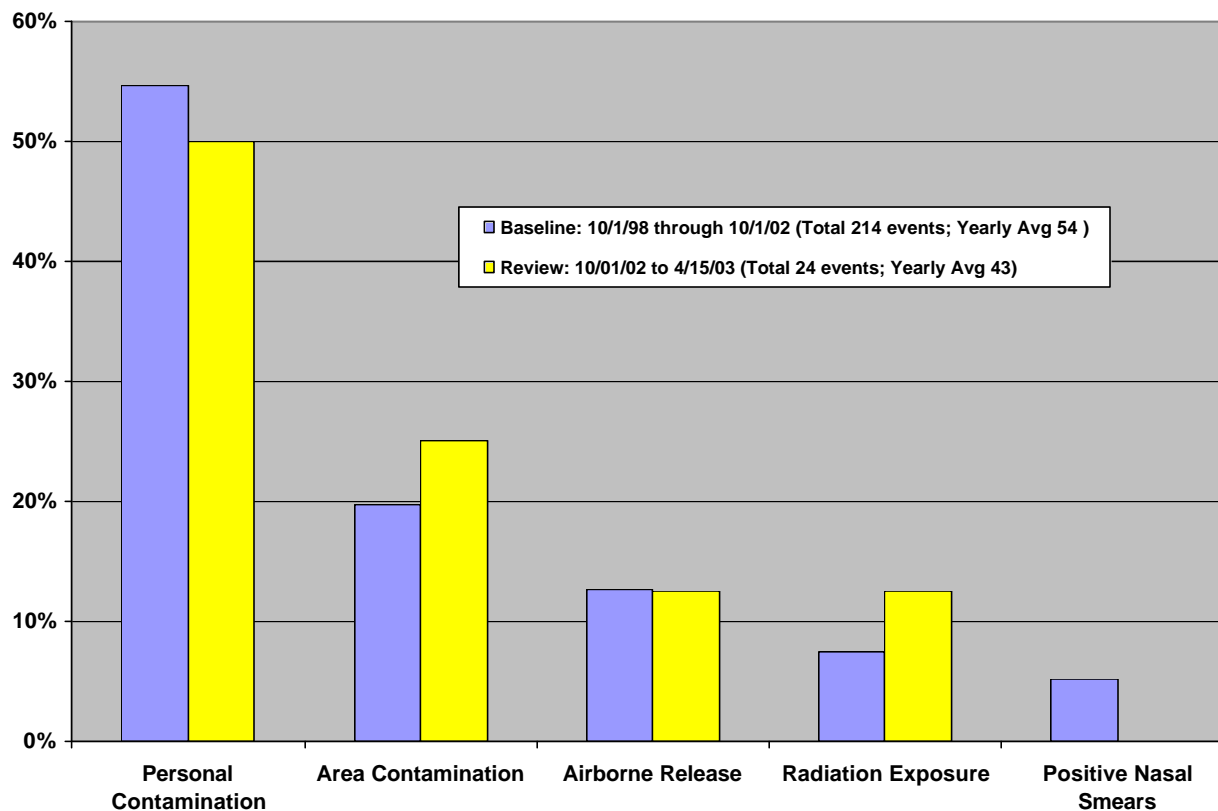 - Review: 24 events

Review Period Score	
🟩	**Sustained Performance**
🟥	**Review Period Trend**
🟥	**Over/Under Trend**
🟩	**Annualized Rate**
🟩	**Control Limit**
🟨	**OVERALL SCORE**

* **Does not include TA-55 airborne events since 4/24/03**
CLICK HERE FOR UPDATED TA-55 CHART

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Type Distribution of LANL Radiological Protection Occurrences

**Radiological Protection Occurrences by Type**
Baseline vs. Review

• Overall static performance for most radiological types

• Personnel contamination events account for about 55% of baseline and 50% of review period

• Area contamination events events account for nearly 20% of baseline and 25% of review period

Chart legend:
- Baseline: 10/1/98 through 10/1/02 (Total 214 events; Yearly Avg 54)
- Review: 10/01/02 to 4/15/03 (Total 24 events; Yearly Avg 43)

Categories: Personal Contamination, Area Contamination, Airborne Release, Radiation Exposure, Positive Nasal Smears

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LANL Personnel Contamination Occurrence Performance

Personnel Contamination Control Chart
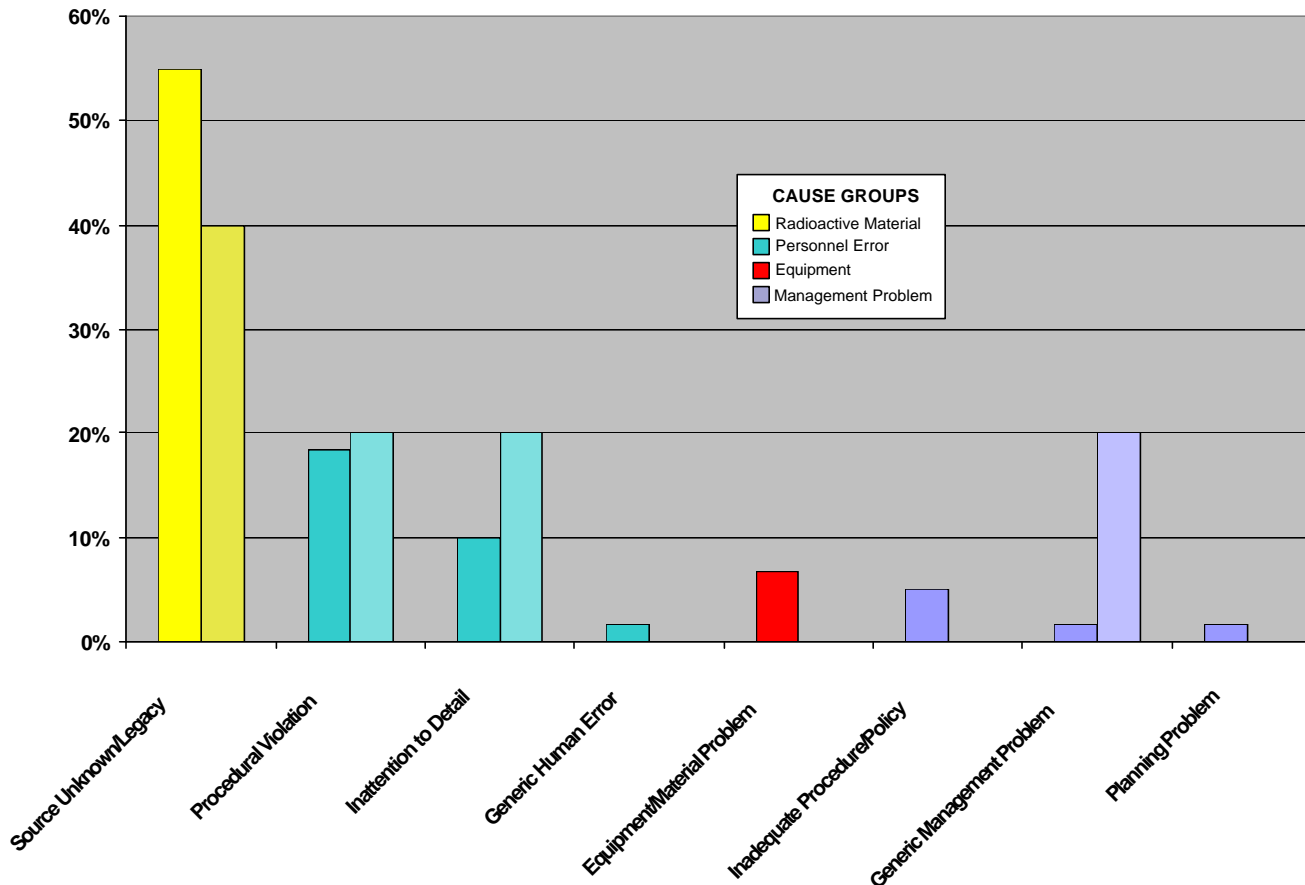**(1/94 to 4/24/03)**

- 328 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 256 events
  - Baseline: 60 events
  - Review: 12 events
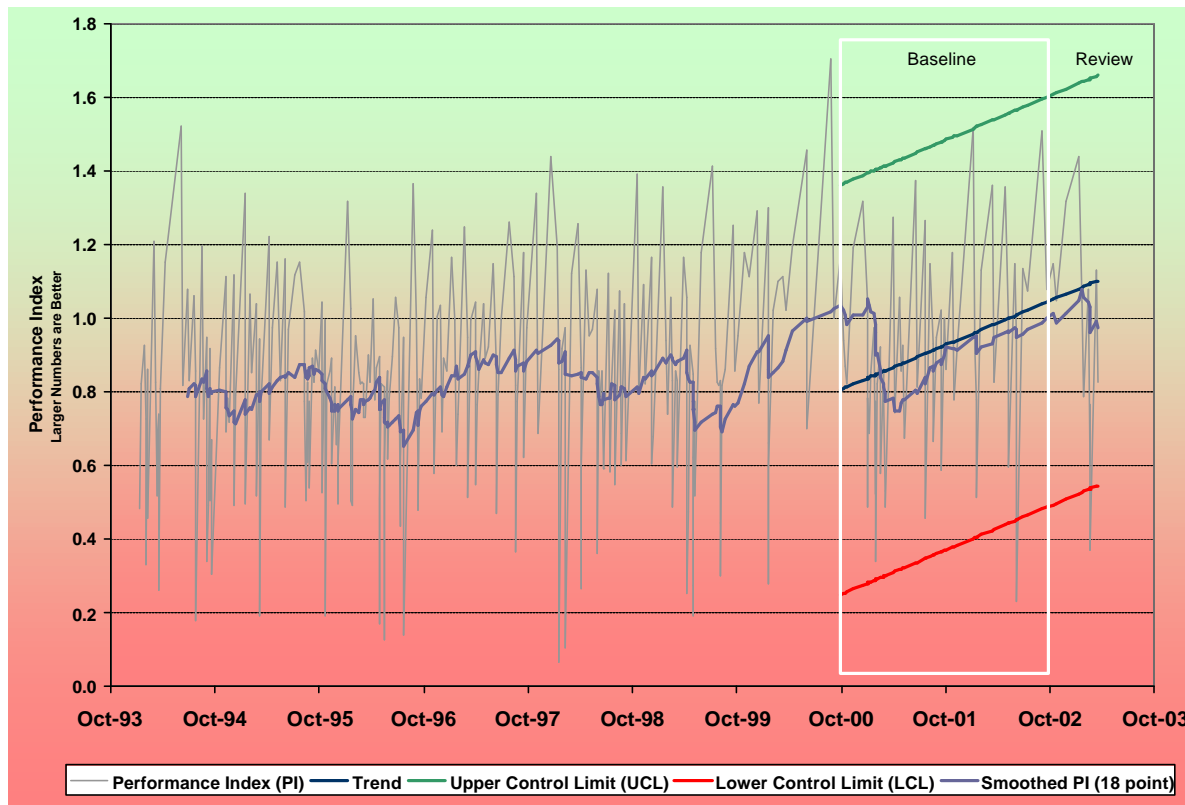
Review Period Score	
	Sustained Performance
	Review Period Trend
	Over/Under Trend
	Annualized Rate
	Control Limit
	OVERALL SCORE

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Direct Causes of Personnel Contamination Occurrences

Direct Causes
Baseline vs. Review

• Legacy Contamination or Unknown Source predominant direct cause with 55% of baseline and 40% of review period

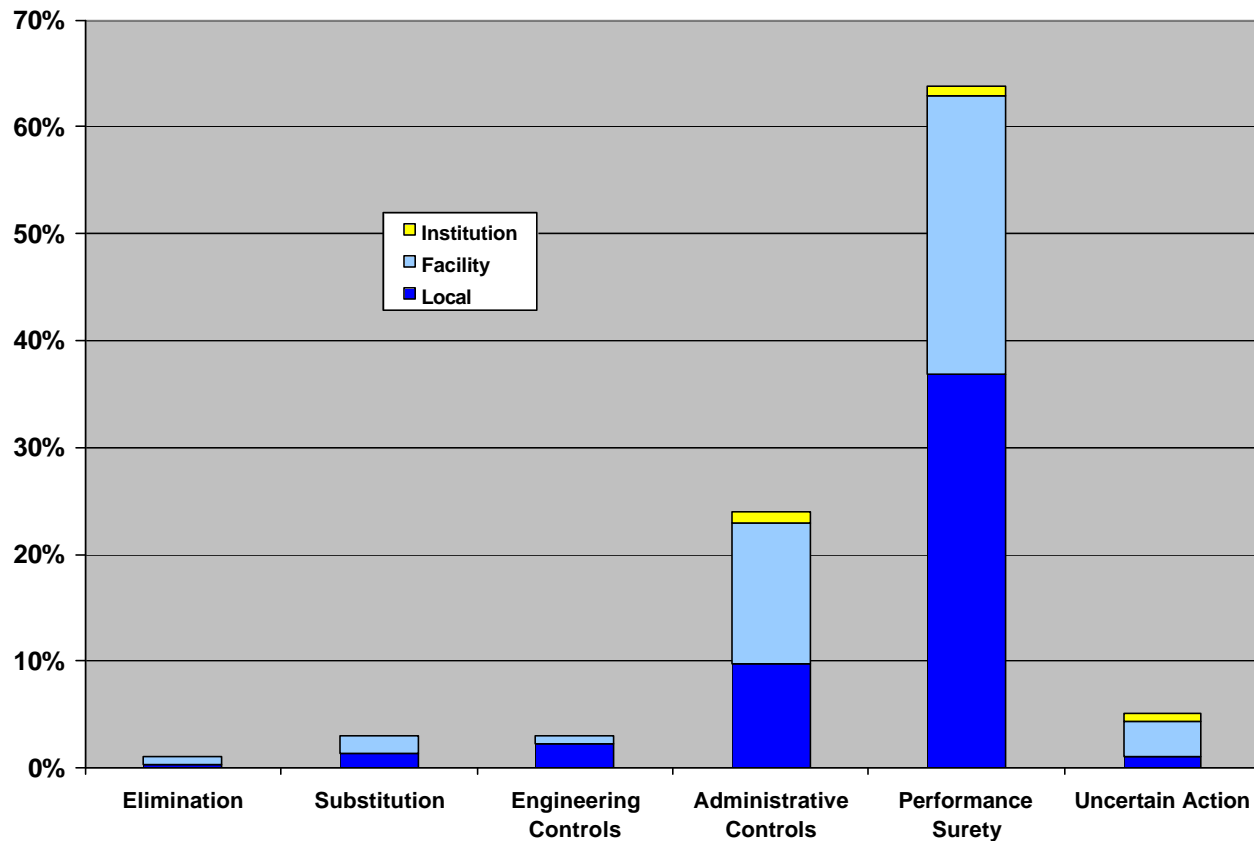• Personnel Error increases from 30% of baseline to 40% of review period

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Root Causes of Personnel Contamination Occurrences

Root Causes
Baseline vs. Review

• Equipment failure decreases from 42% of baseline to 33% of review period
• Absence of Management Problem as root cause in review period
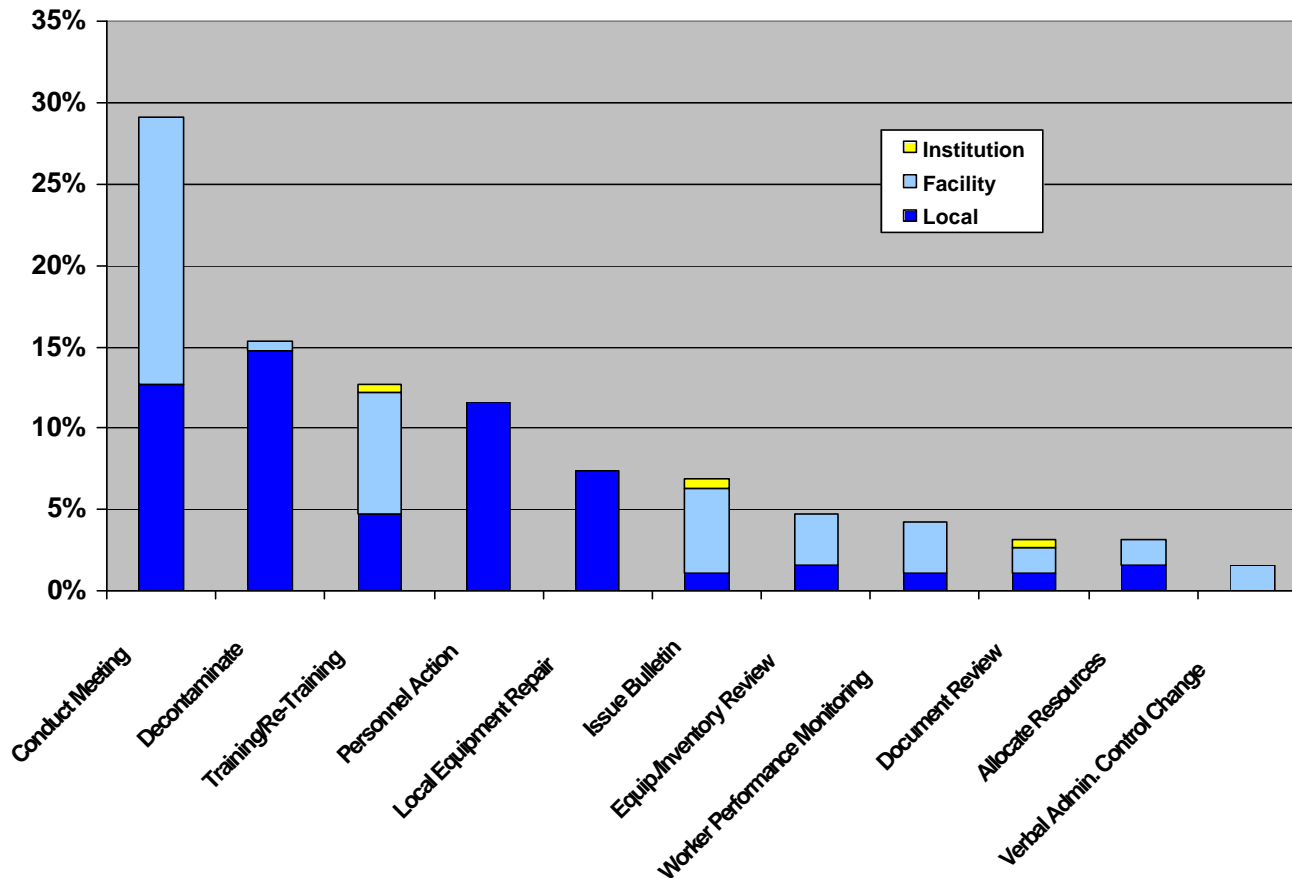• Personnel Error increases from 8% to 67% in review period

CAUSE GROUPS
- Radioactive Material
- Management Problem
- Personnel Error
- Equipment

Source Unknown/Legacy
Inadequate Procedure/Policy
Generic Management Problem
Planning Problem
Inadequate Supervision
Procedural Violation
Inattention to Detail
Generic Human Error
Equipment/Material Problem
Design Problem

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Profile of Corrective Actions for Personnel Contamination Occurrences

Corrective Actions
(10/97 to 4/24/03)

• About 9% of actions target eliminating or substituting for lesser hazard
• No actions specify new or modified engineering barriers
• 19% of actions targeted at institutional level
• About 75% of all actions target "performance surety" actions

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

X-axis categories: Elimination, Substitution, Engineering Controls, Administrative Controls, Performance Surety, Uncertain Action

Y-axis: 0% to 70%

Performance Surety Actions for Personnel Contamination Occurrences


Performance Surety Actions
(10/97 to 4/24/03)

• Most performance surety actions involve local or facility response to Property/Equipment problems—document or equipment reviews, issuance of bulletins, repairs, and training

• 22% of performance surety actions targeted at institutional level

• No actions targeted at active worker monitoring

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LANL Area Contamination Occurrence Performance

Area Contamination Control Chart
(1/94 to 4/24/03)
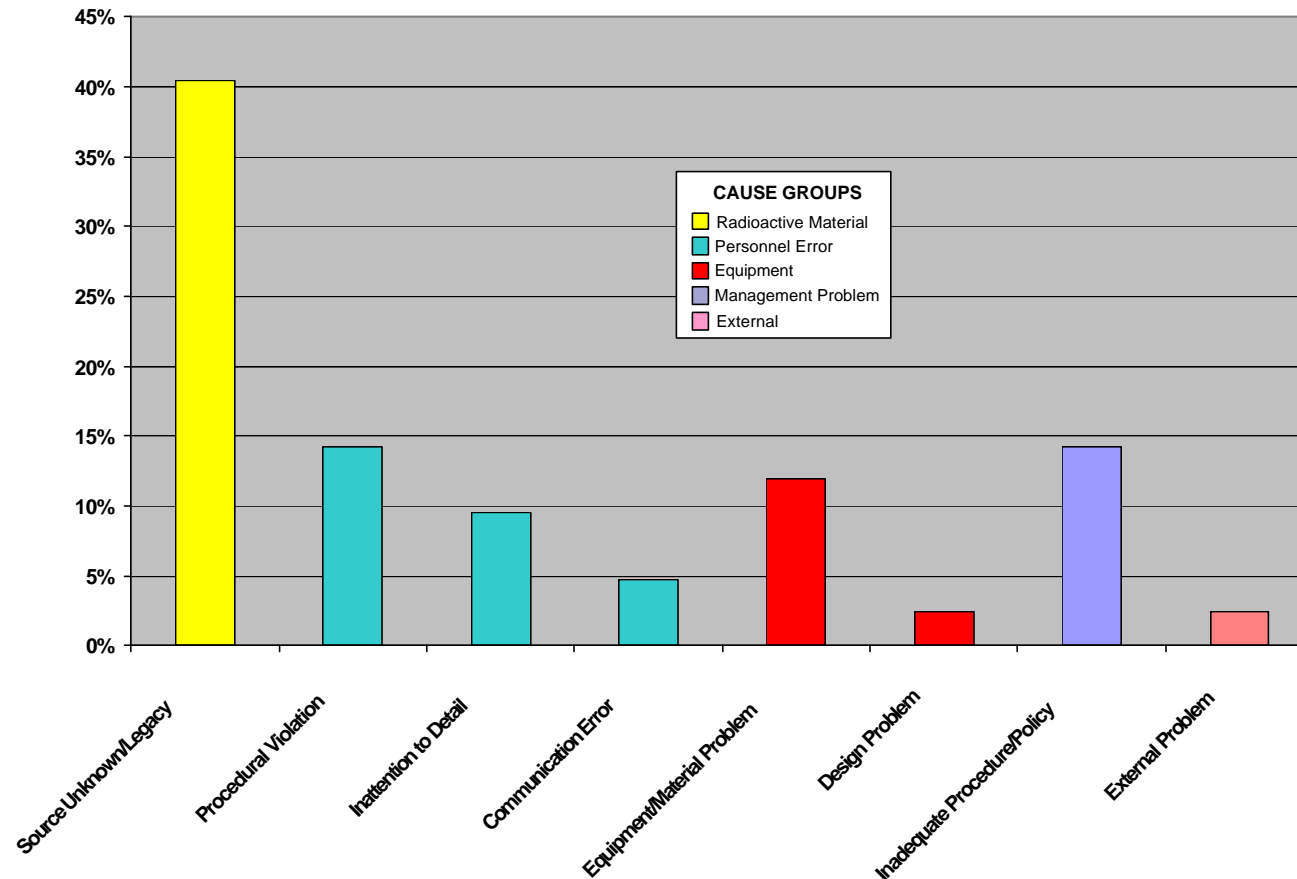
- 178 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 130 events
  - Baseline: 42 events
  - Review: 6 events
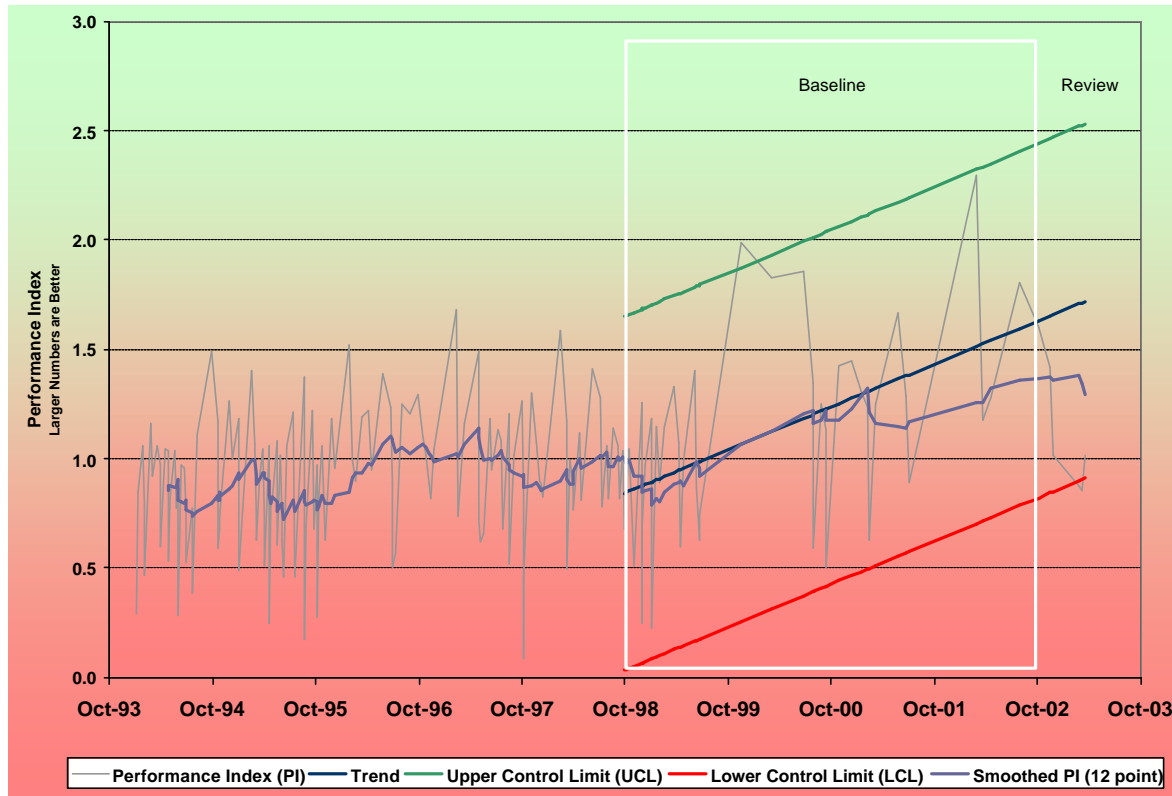
Review Period Score	
🟩	**Sustained Performance**
🟥	**Review Period Trend**
🟥	**Over/Under Trend**
🟨	**Annualized Rate**
🟥	**Control Limit**
🟨	**OVERALL SCORE**

Direct Causes of Area Contamination Occurrences

CAUSE GROUPS
- Radioactive Material
- Personnel Error
- Equipment
- Management Problem
- External

Direct Causes
Baseline vs. Review

• Legacy Contamination or Unknown Source identified as direct cause in 40% of area contamination events

• Personnel Error identified as direct cause in 29% of area contamination events

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Root Causes of Area Contamination Occurrences
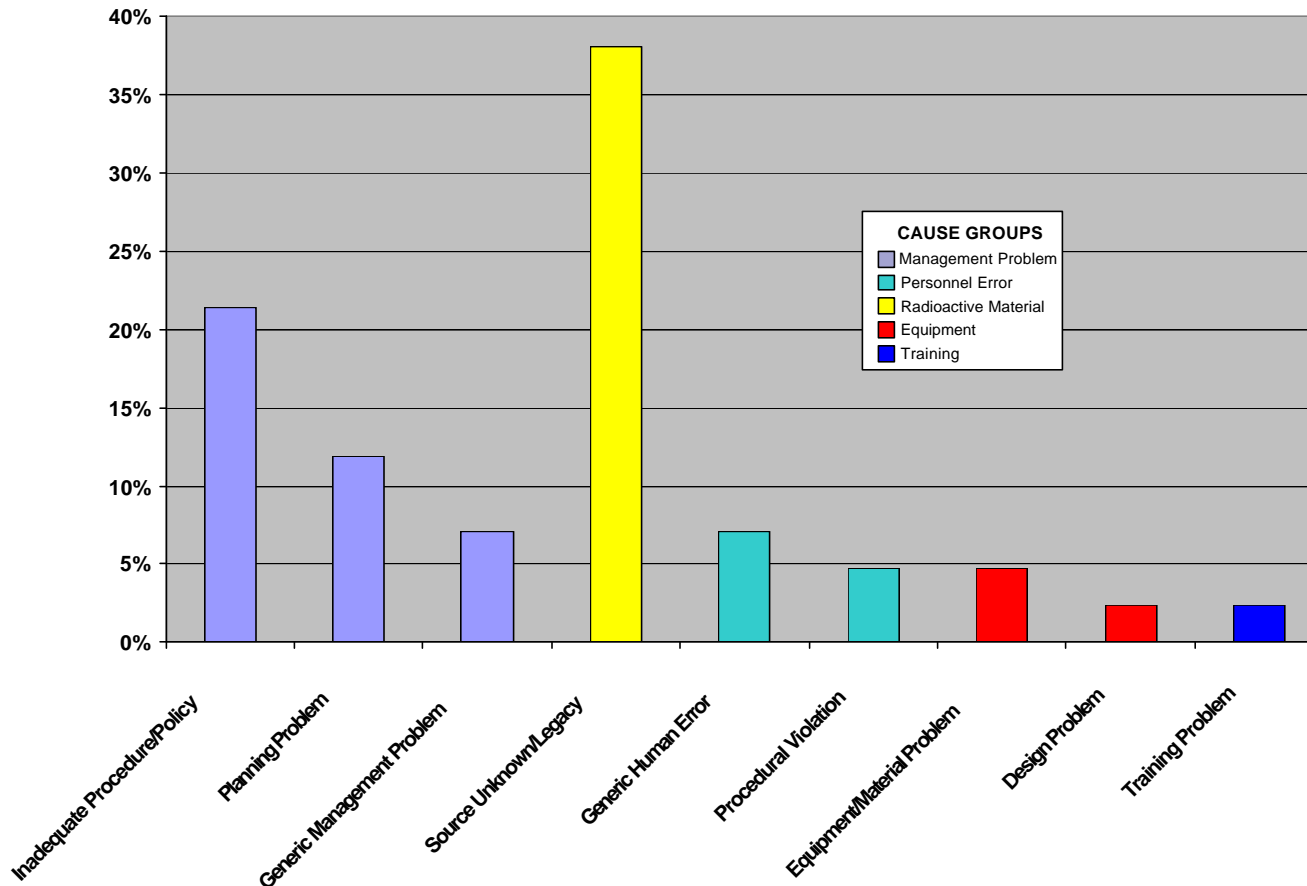
Root Causes
Baseline vs. Review

• Management Problem identified as root cause in 40% of area contamination events
• Legacy Contamination or Source Unknown identified as root cause in 38% of area contamination events

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Profile of Corrective Actions for Area Contamination Occurrences
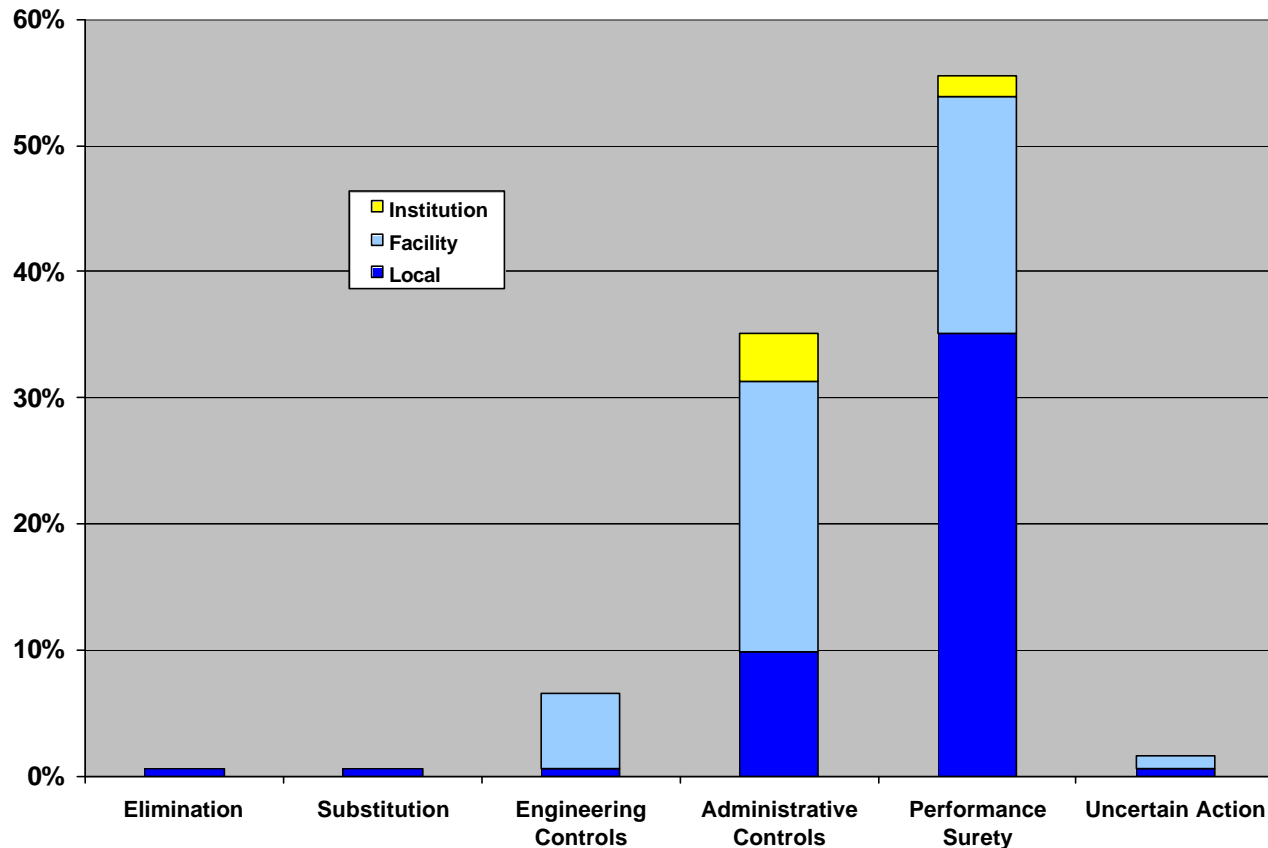
Corrective Actions
(10/97 to 4/24/03)

• About 2% of actions target eliminating or substituting for lesser hazard
• About 7% of actions specify new or modified engineering barriers
• About 5% of actions targeted at institutional level
• About 56% of all actions target "performance surety" actions

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Performance Surety Actions for Area Contamination Occurrences
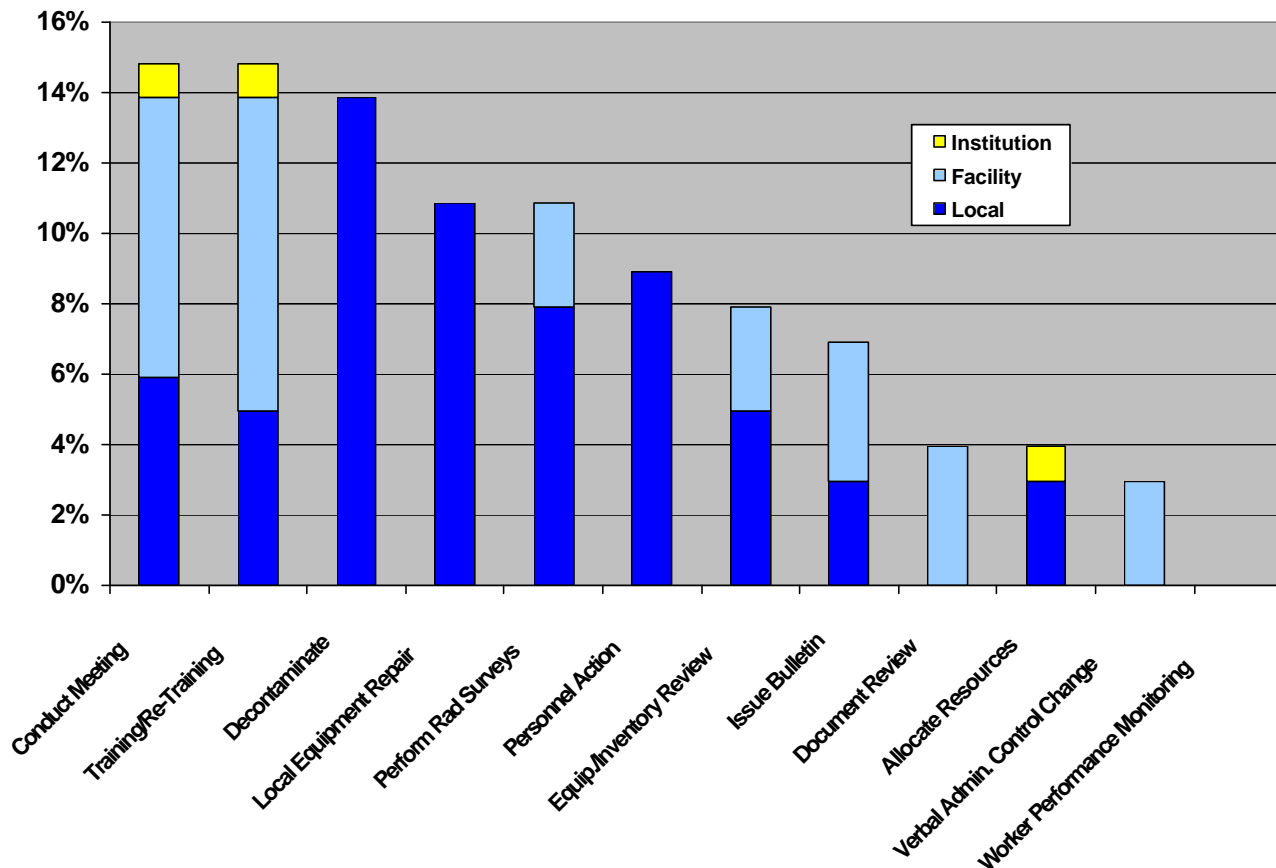
Performance Surety Actions
(10/97 to 4/24/03)

• Most performance surety actions involve local or facility response to Area Contamination events—review meetings, training, decontamination, repairs, and surveys
• 3% of performance surety actions targeted at institutional level
• No actions targeted at active worker monitoring

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LANL Airborne Release* Occurrence Performance
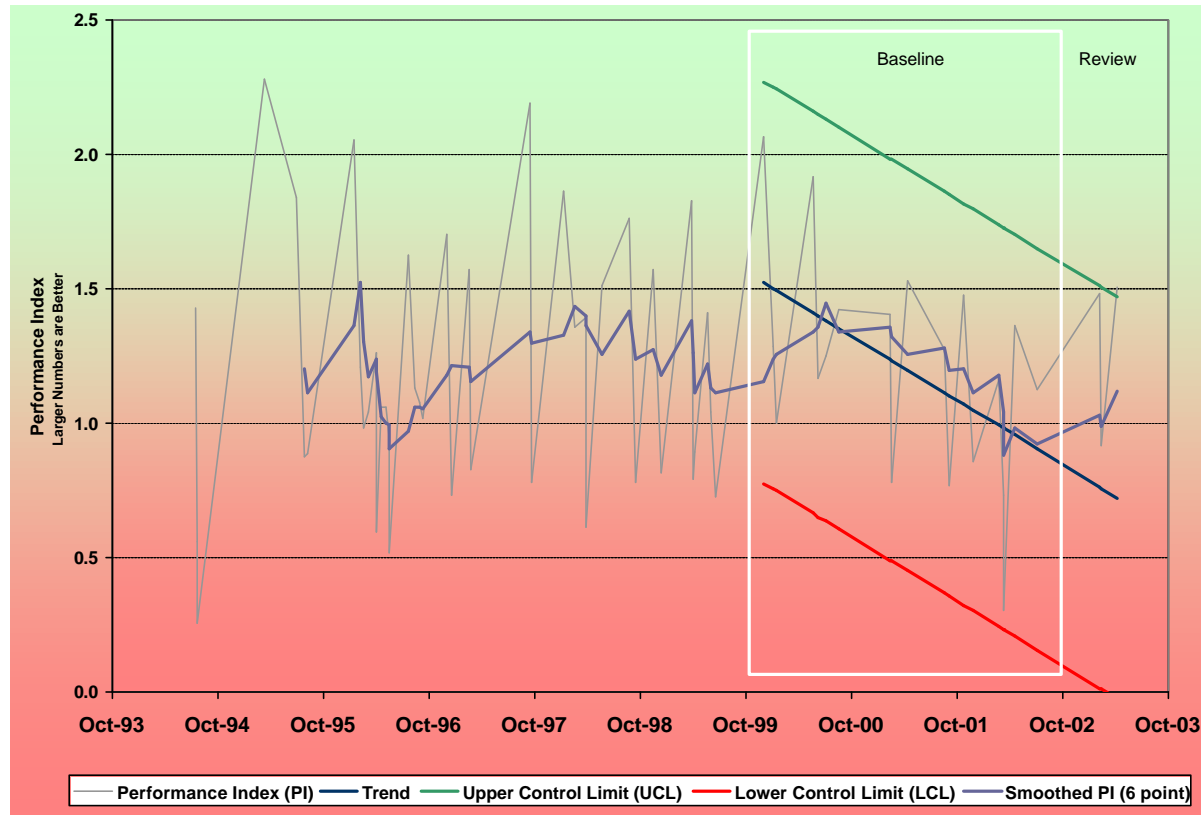
Airborne Release Control Chart
(1/94 to 4/24/03)

- 65 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 43 events
  - Baseline: 19 events
  - Review: 3 events

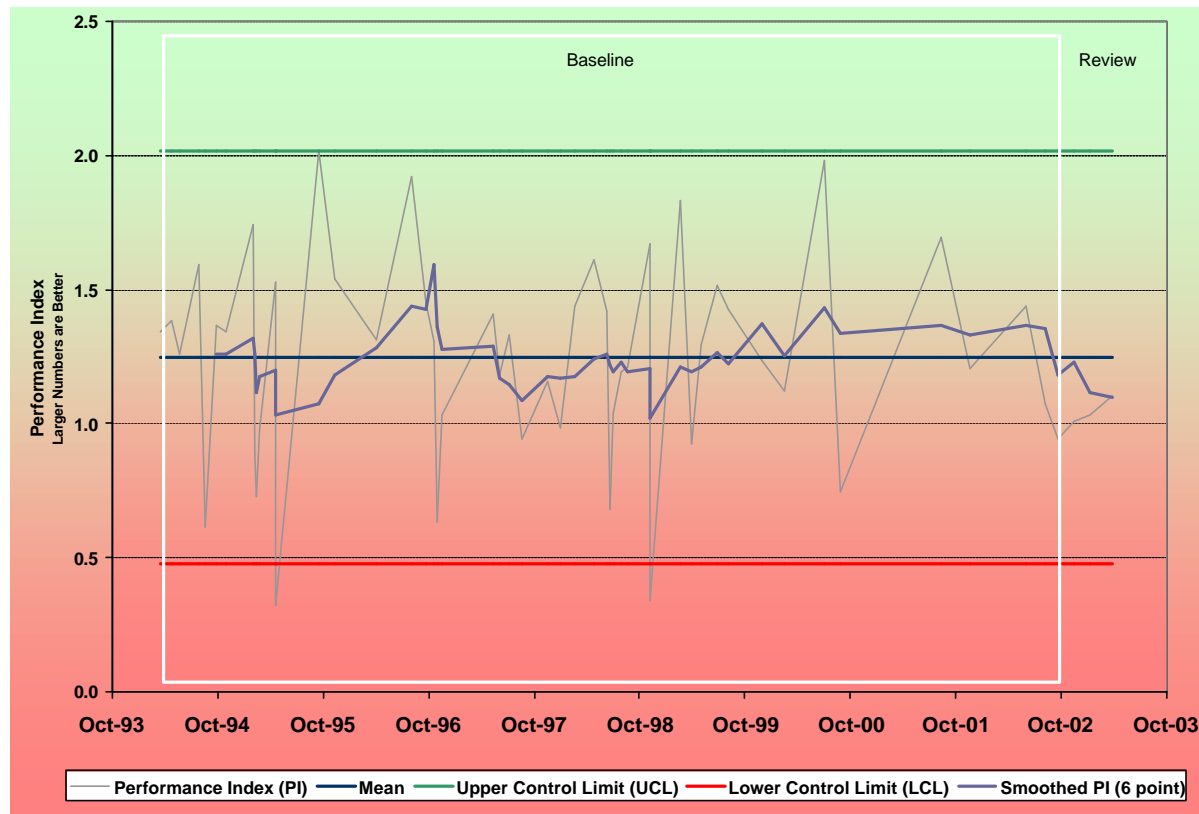| Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
🟩	**Control Limit**
🟩	**OVERALL SCORE**

* **Does not include TA-55 airborne events since 4/24/03**
CLICK HERE FOR UPDATED TA-55 CHART

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LANL Radiation Exposure Occurrence Performance

Radiation Exposure Control Chart
(1/94 to 4/24/03)

• 54 total events severity weighted 2, 3, or 4
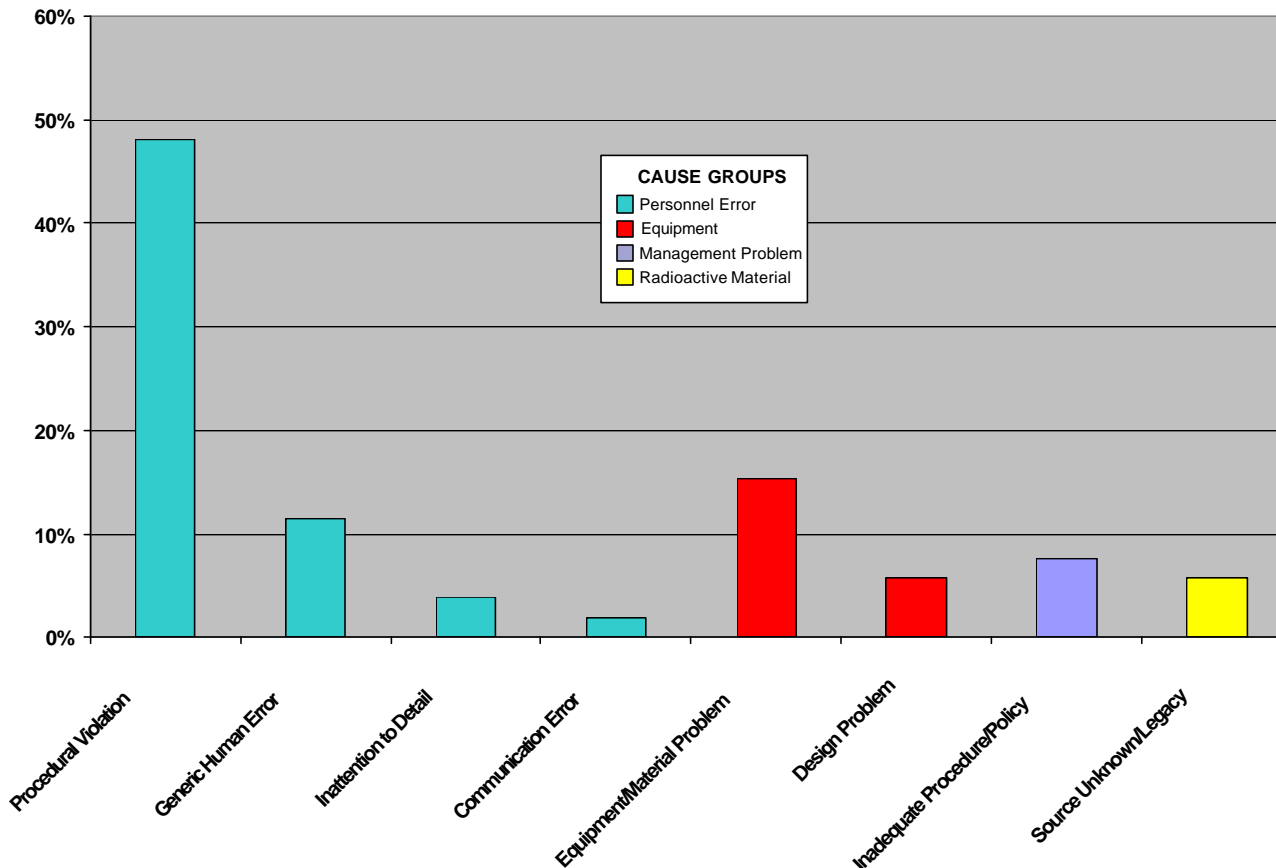
  • Baseline: 51 events

  • Review: 3 events

| Review Period Score	
🟨	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟨	Annualized Rate
N/A	Control Limit
🟨	OVERALL SCORE

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Direct Causes of Radiation Exposure Occurrences

Direct Causes
Baseline and Review

• Personnel Error identified as direct cause in 66% of radiation exposure events

• Equipment Problem identified as direct cause in 21% of radiation exposure events
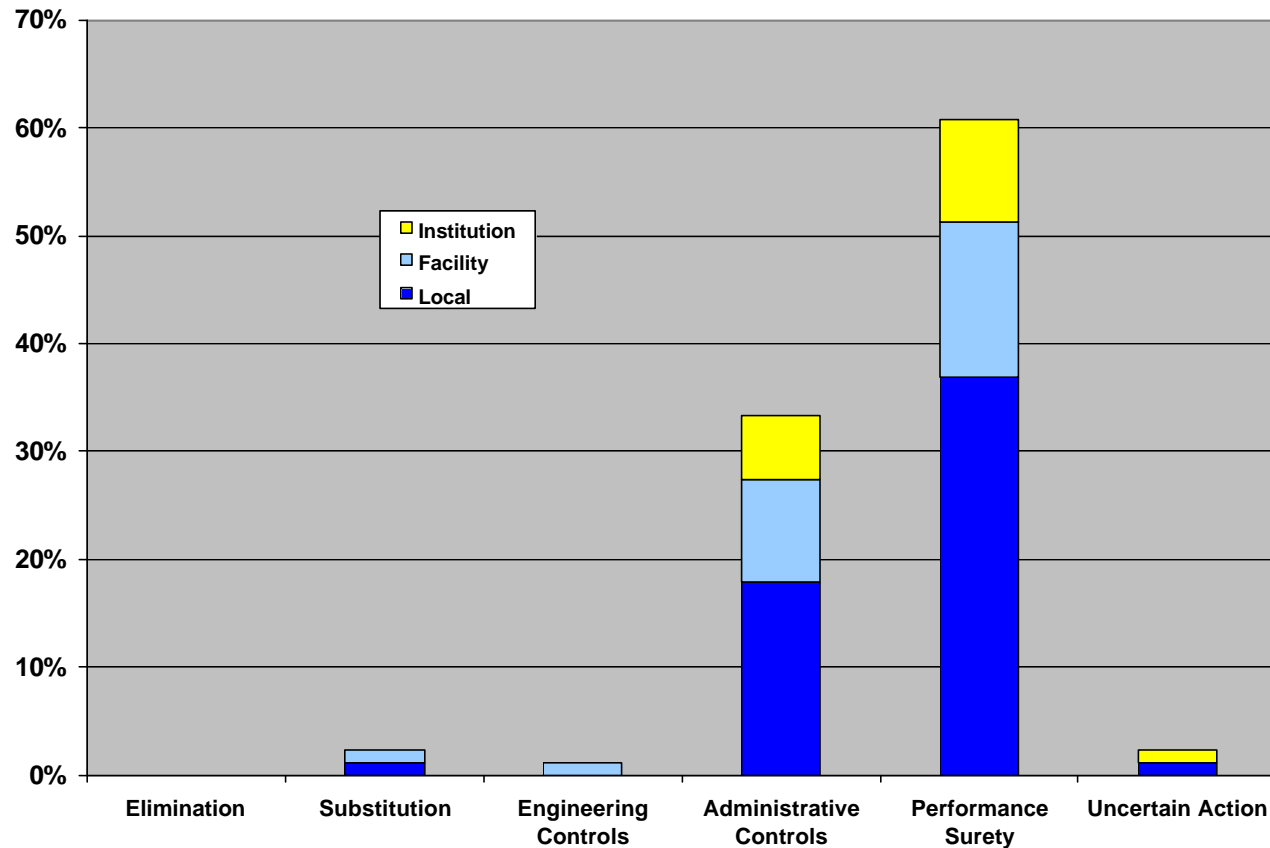
Root Causes of Radiation Exposure Occurrences
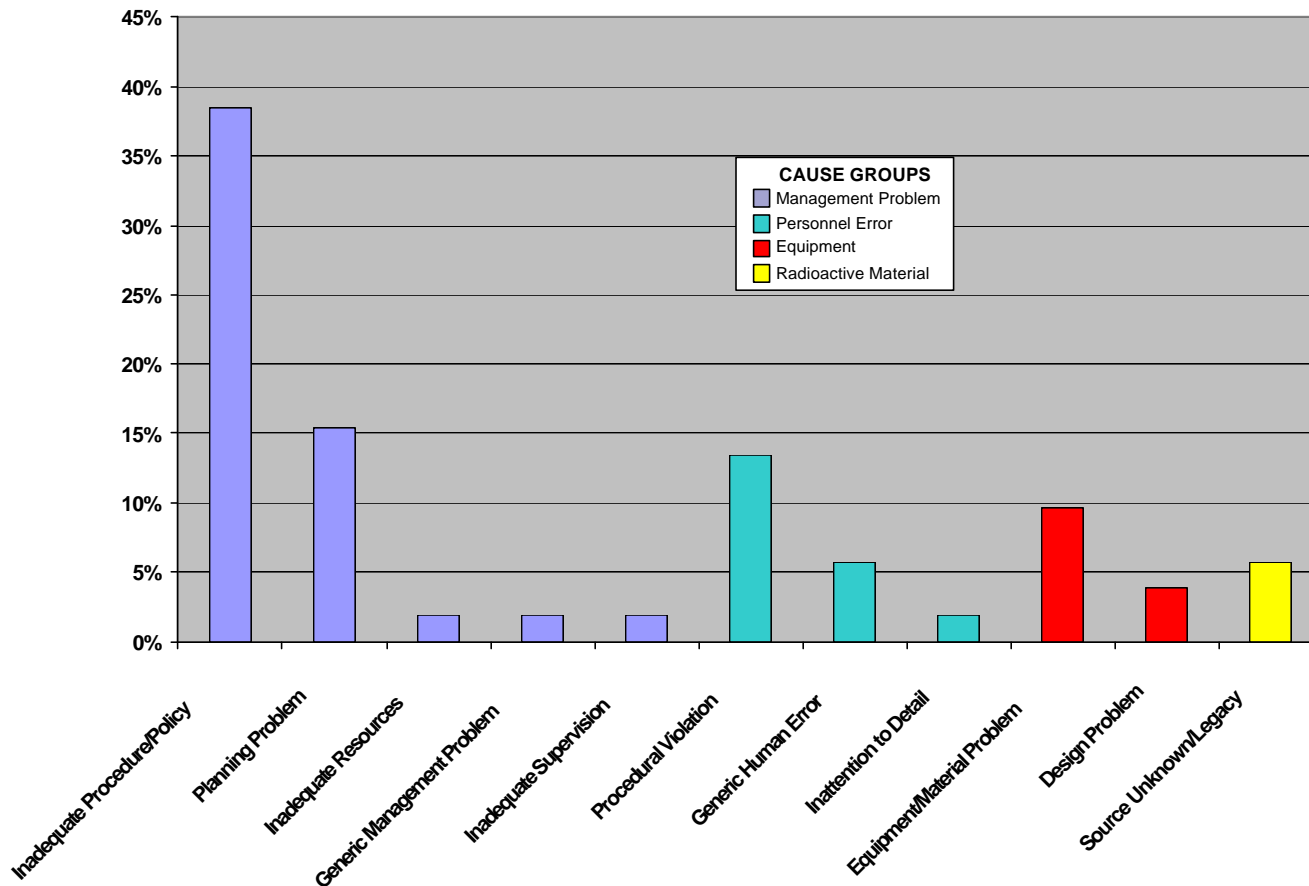
Root Causes
Baseline and Review

- Management Problem identified as root cause in nearly 60% of radiation exposure events
- Personnel Error identified as root cause in 21% of radiation exposure events

CAUSE GROUPS
- Management Problem
- Personnel Error
- Equipment
- Radioactive Material

Inadequate Procedure/Policy, Planning Problem, Inadequate Resources, Generic Management Problem, Inadequate Supervision, Procedural Violation, Generic Human Error, Inattention to Detail, Equipment/Material Problem, Design Problem, Source Unknown/Legacy

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# Profile of Corrective Actions for Radiation Exposure Occurrences

Corrective Actions (10/97 to 4/24/03)

- About 2% of actions target eliminating or substituting for lesser hazard
- About 1% of actions specify new or modified engineering barriers
- About 17% of actions targeted at institutional level
- About 33% of all actions target administrative control modifications and 61% target "performance surety" actions

Performance Surety Actions for Radiation Exposure Occurrences

Chart legend:
- Institution (yellow)
- Facility (light blue)
- Local (blue)

X-axis categories: Document Review, Training/Re-Training, Equip/Inventory Review, Verbal Admin. Control Change, Conduct Meeting, Personnel Action, Allocate Resources, Local Equipment Repair, Issue Bulletin, Worker Performance Monitoring, Decontaminate, Perform Rad Surveys

Y-axis: 0% to 20%

Performance Surety Actions
(10/97 to 4/24/03)

• Most performance surety actions involve local or facility response to Radiation Exposures—document or equipment reviews, training, verbal changes to administrative controls, and meetings
• 16% of performance surety actions targeted at institutional level
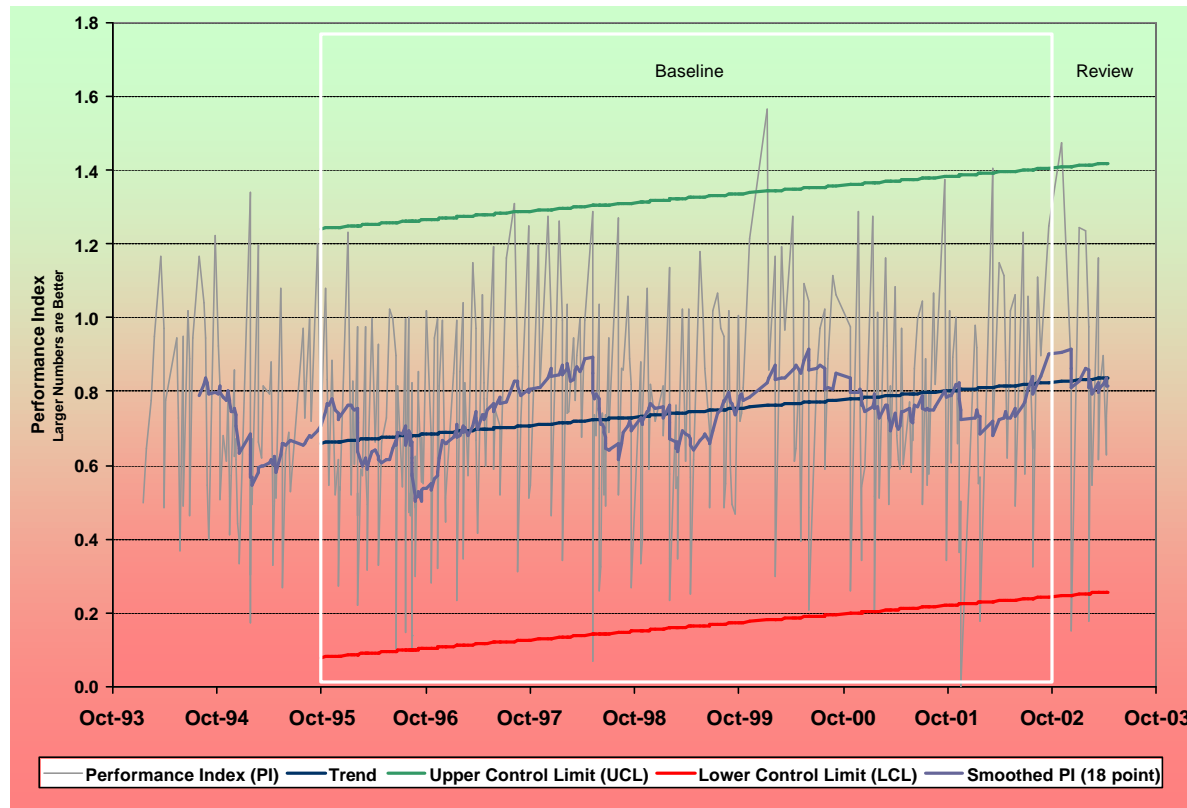• Less than 5% of performance surety actions targeted at active worker monitoring

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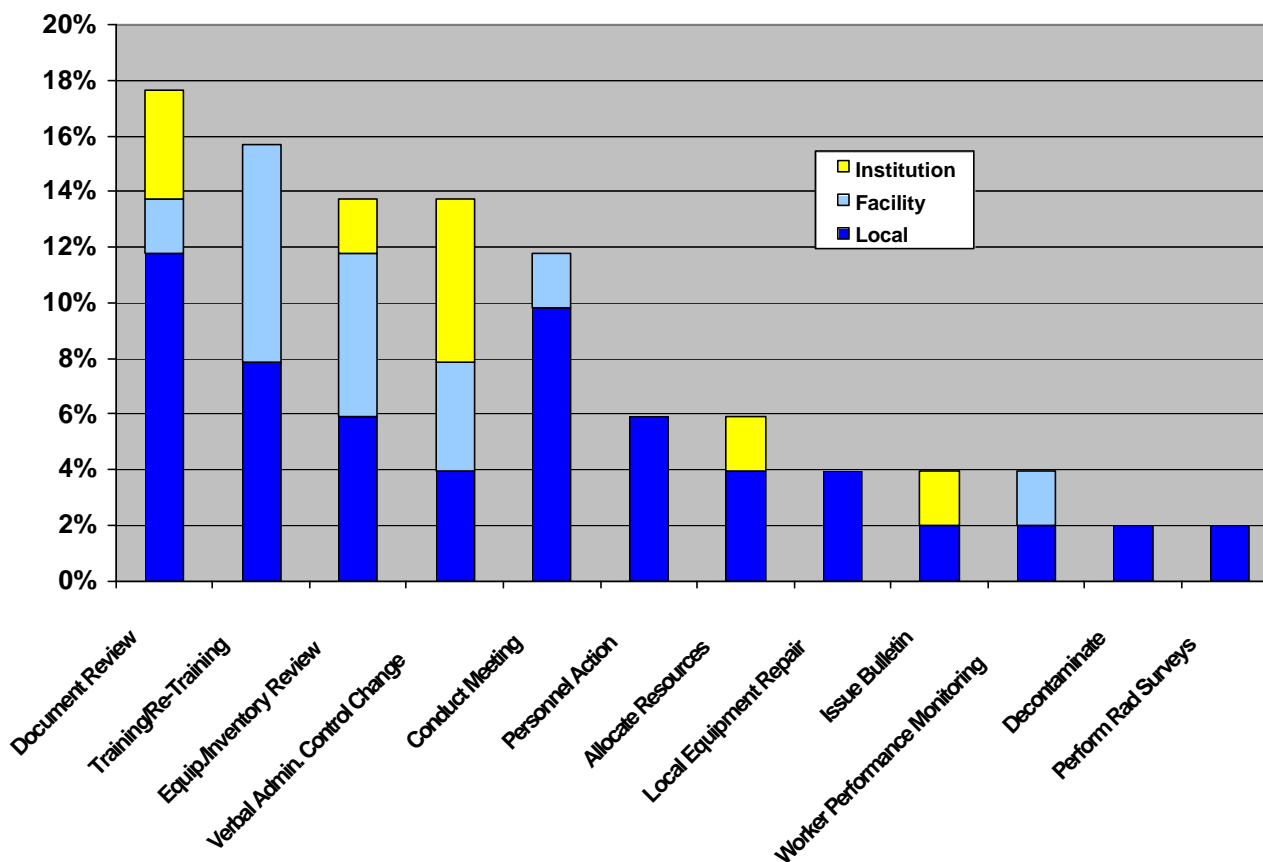
Personnel Safety Occurrences

FY2003
(6 month)

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LANL Personnel Safety Occurrence Performance

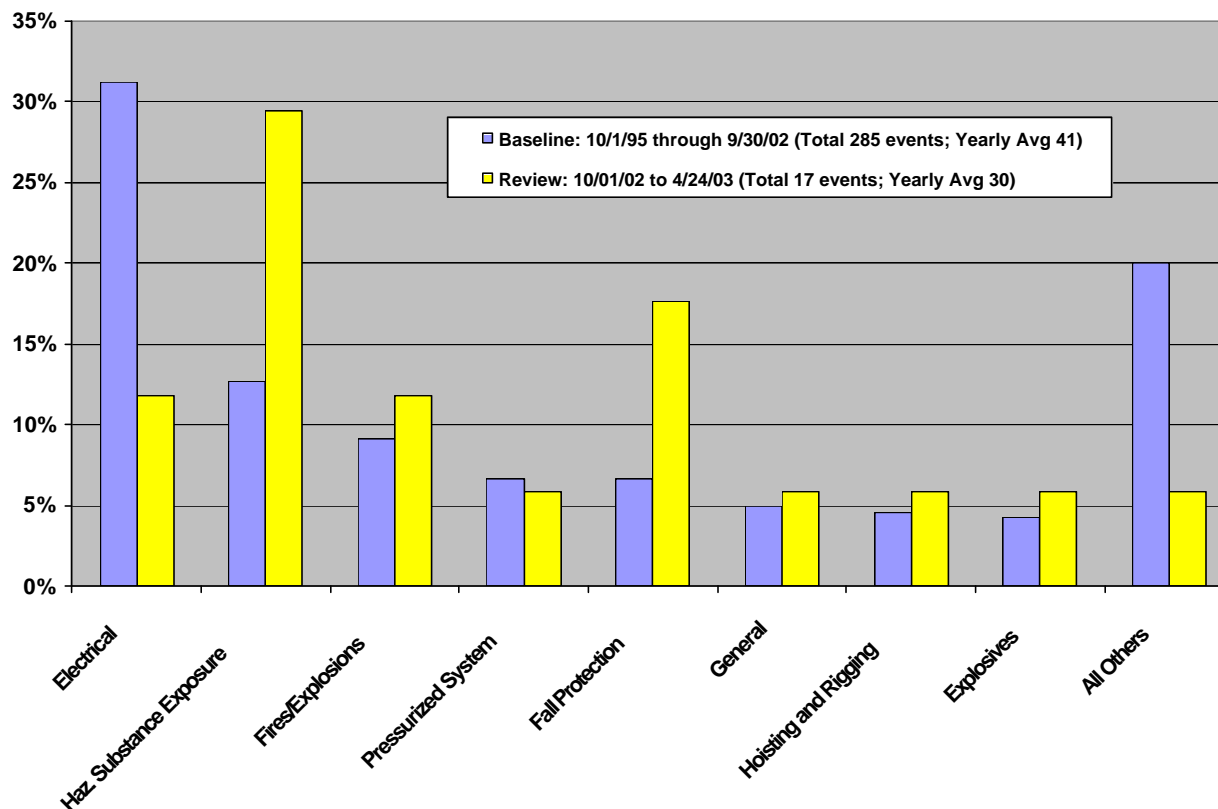

Personnel Safety PI Control Chart
(1/94 to 4/24/03)

- 374 total events severity weighted 2, 3, or 4

  - Pre-Baseline: 72 events

  - Baseline: 285 events

  - Review: 17 events

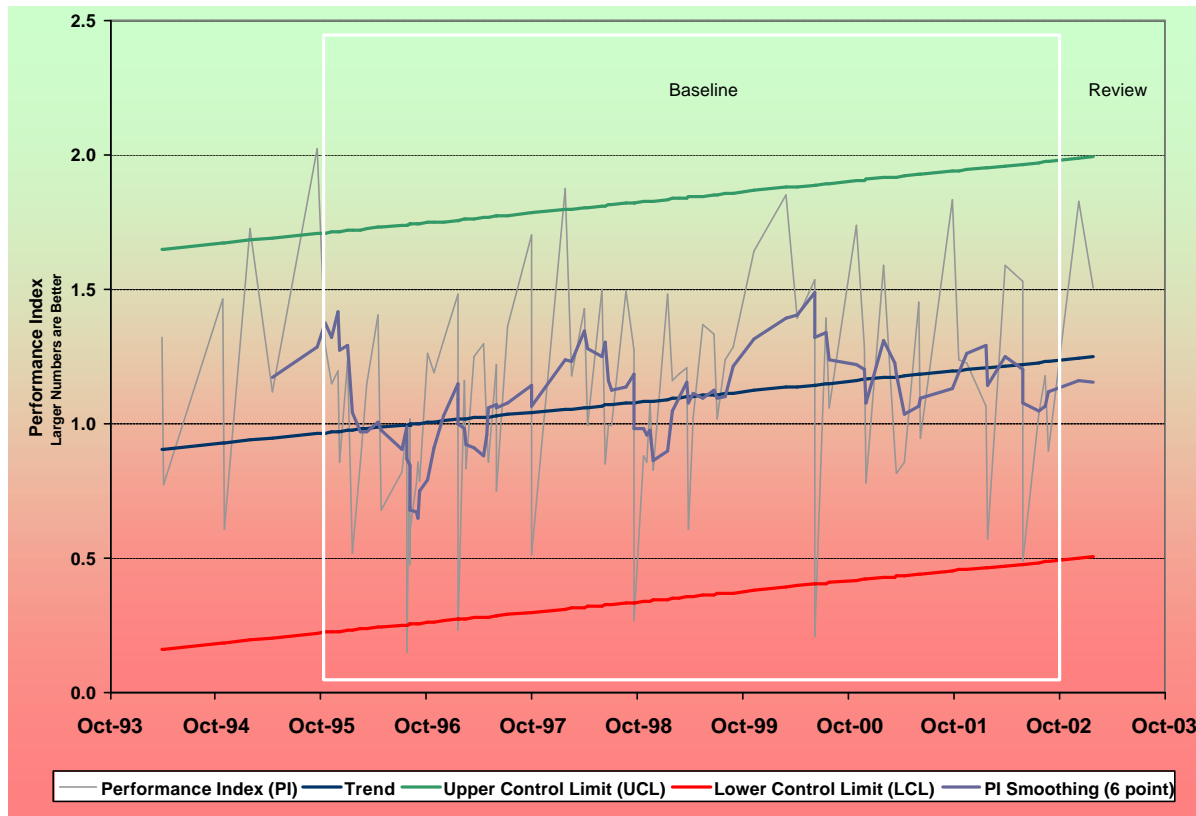| Review Period Score	
🟢	**Sustained Performance**
🟡	**Review Period Trend**
🟡	**Over/Under Trend**
🟢	**Annualized Rate**
🔴	**Control Limit**
🟡	**OVERALL SCORE**

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Type Distribution of LANL Personnel Safety Occurrences

Personnel Safety Occurrences by Type
Baseline vs. Review

Chart legend:
- Baseline: 10/1/95 through 9/30/02 (Total 285 events; Yearly Avg 41)
- Review: 10/01/02 to 4/24/03 (Total 17 events; Yearly Avg 30)

Categories: Electrical, Haz Substance Exposure, Fires/Explosions, Pressurized System, Fall Protection, General, Hoisting and Rigging, Explosives, All Others

• Electrical safety events decrease from more than 30% of baseline to about 12% of review period

• Hazardous substance exposures increase from about 13% of baseline to nearly 30% of review period

• Fall protection events increase from 7% of baseline to 18% of review period

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LANL Electrical Safety Occurrence Performance

Electrical Safety Control Chart
(1/94 to 4/24/03)
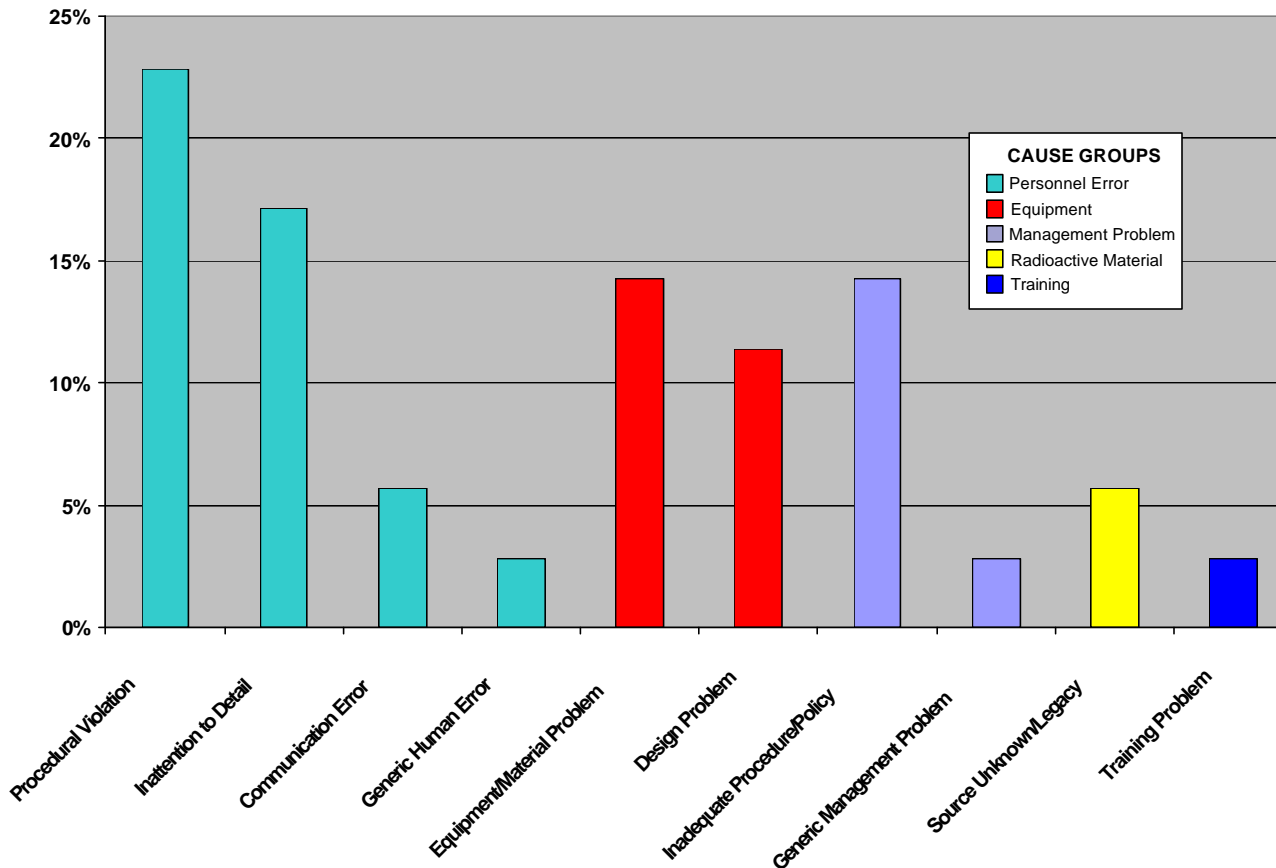
- 99 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 8 events
  - Baseline: 89 events
  - Review: 2 events

Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Chart legend: Performance Index (PI) — Trend — Upper Control Limit (UCL) — Lower Control Limit (LCL) — PI Smoothing (6 point)

LANL Hazardous Exposure Occurrence Performance

Hazardous Exposure Control Chart
(1/94 to 4/24/03)

- 51 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 10 events
  - Baseline: 36 events
  - Review: 5 events
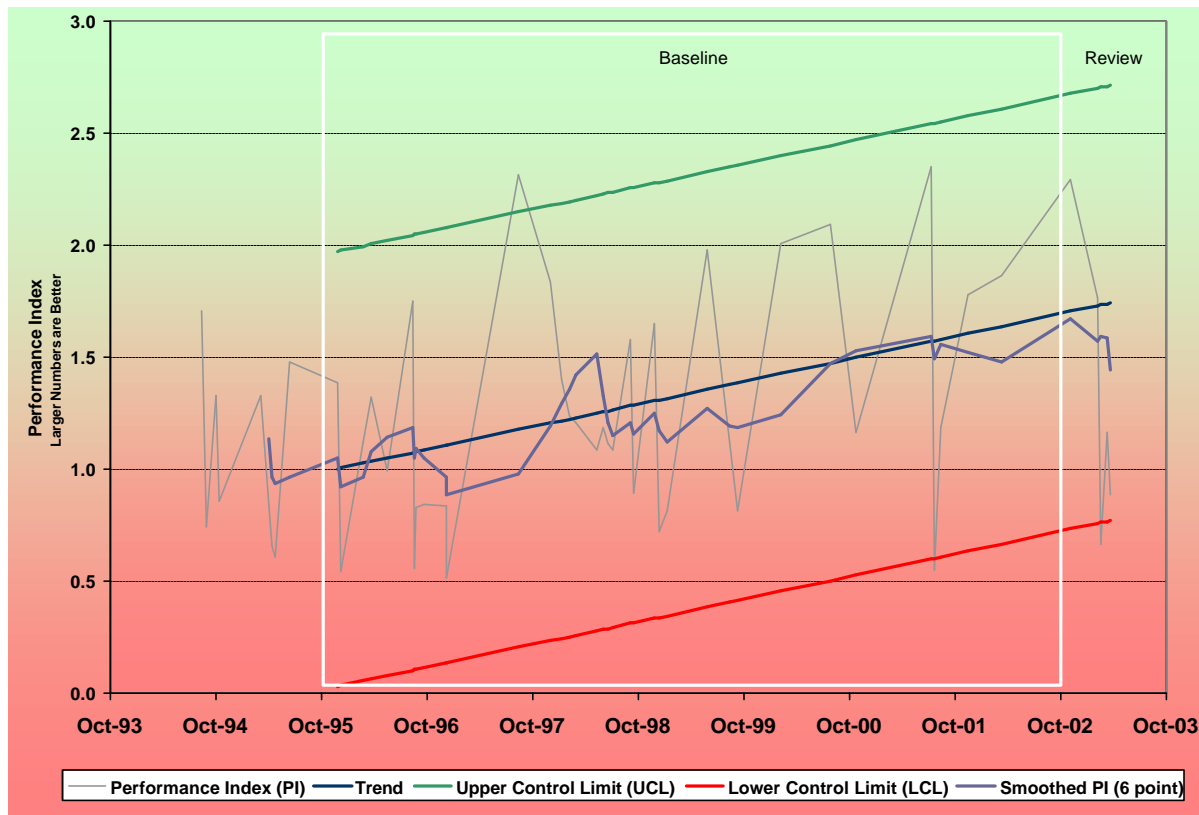
Review Period Score	
	Sustained Performance
	Review Period Trend
	Over/Under Trend
	Annualized Rate
	Control Limit
	OVERALL SCORE

Los Alamos

Direct Causes of LANL Hazardous Exposure Occurrences

CAUSE GROUPS
- Personnel Error
- Equipment
- Management Problem
- Radioactive Material
- Training

Categories (x-axis): Procedural Violation, Inattention to Detail, Communication Error, Generic Human Error, Equipment/Material Problem, Design Problem, Inadequate Procedure/Policy, Generic Management Problem, Source Unknown/Legacy, Training Problem

Direct Causes
Baseline and Review

- Personnel Error is the direct cause of nearly 50% of all hazardous exposure events
- Nearly half of the personnel errors involve violations of procedure
- Equipment Problem identified as direct cause in 25% of hazardous exposure events

Los Alamos

Root Causes of LANL Hazardous Exposure Occurrences
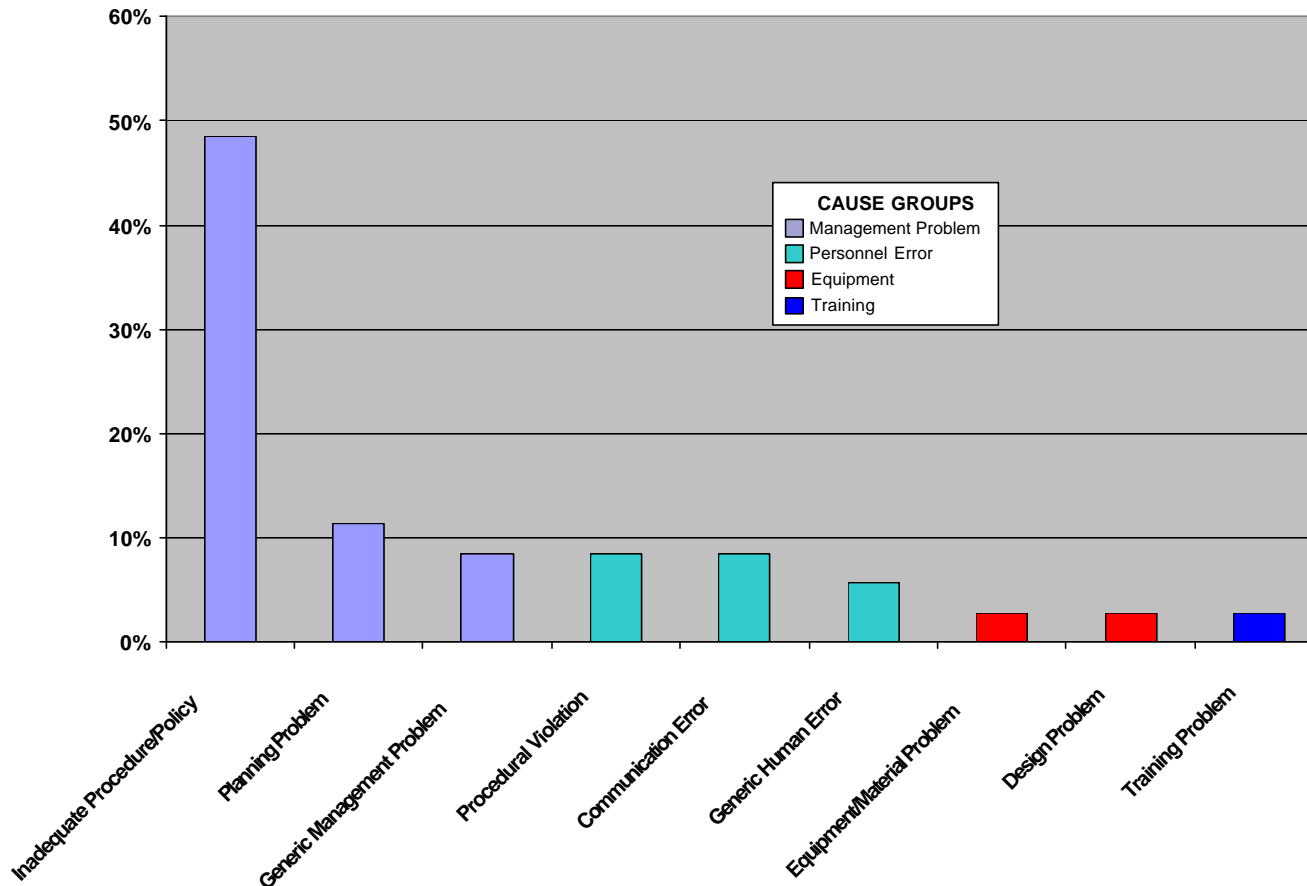
Root Causes
Baseline and Review

• Inadequate Procedures or Policies predominant root cause—nearly 50% of hazardous exposure events
• Additional management problems identified in 20% of events
• Personnel Error comprises most of remainder

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Profile of Corrective Actions for LANL Hazardous Exposure Occurrences
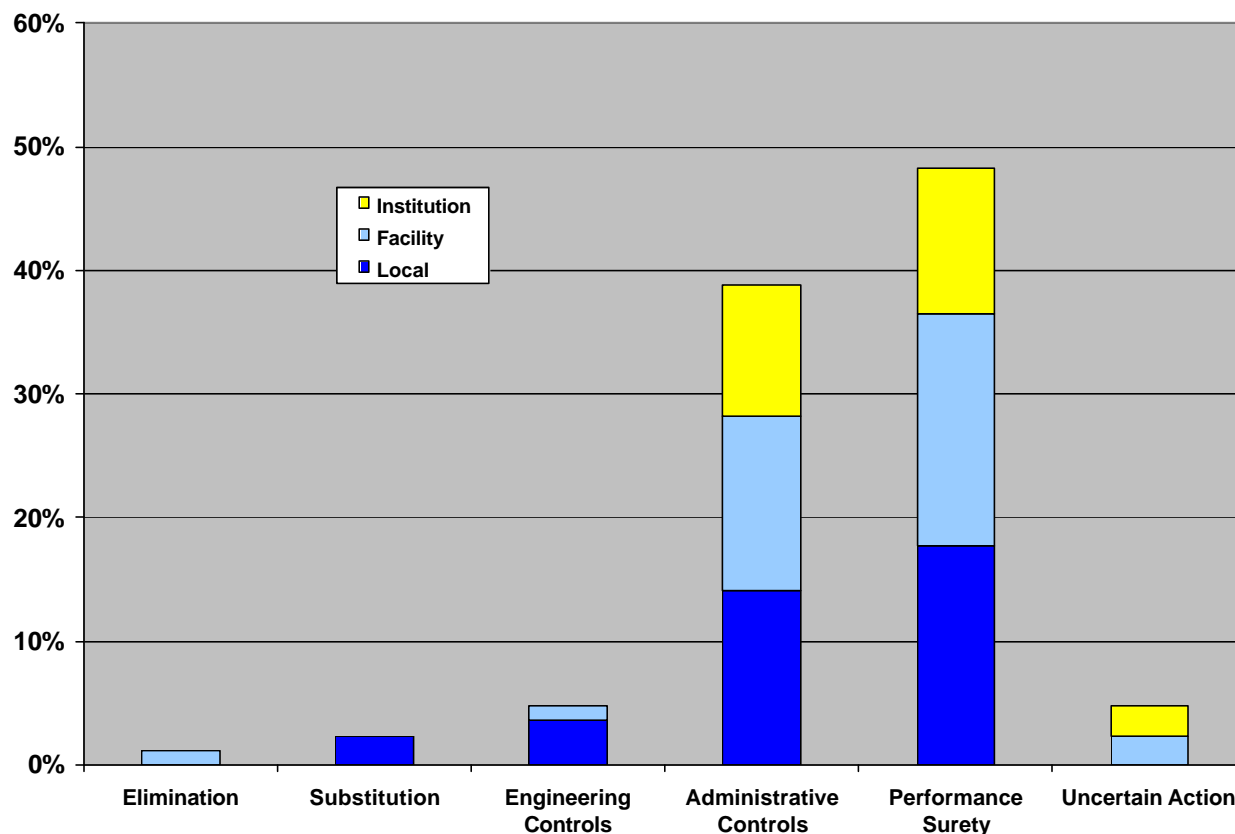
Corrective Actions
(10/01/97 to Present)

• Less than 4% of actions target eliminating or substituting for lesser hazard
• Less than 5% specify new or modified engineering barriers
• More than 85% of all actions are administrative in nature—38% involve procedural changes and 48% "performance surety"
• 25% of actions targeted at institutional level

Performance Surety Actions for LANL Hazardous Exposure Occurrences
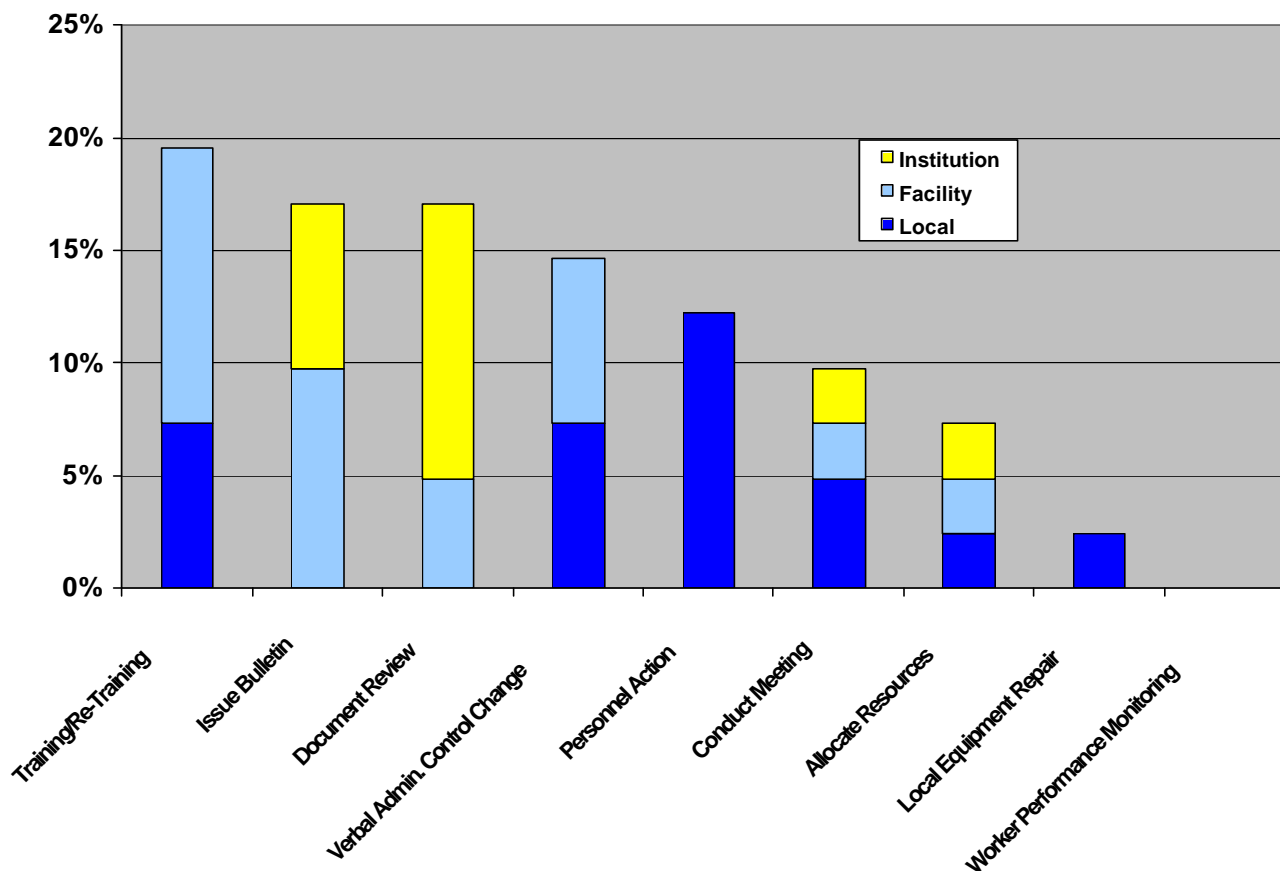
Performance Surety Actions
(10/01/97 to Present)

• Most performance surety actions involve reactive, one-time actions—meetings, bulletins, single training, equipment reviews, etc.
• No actions involve active worker performance monitoring
• 24% of performance surety actions targeted at institutional level— primarily administrative in nature

LANL Fires/Explosions Occurrence Performance
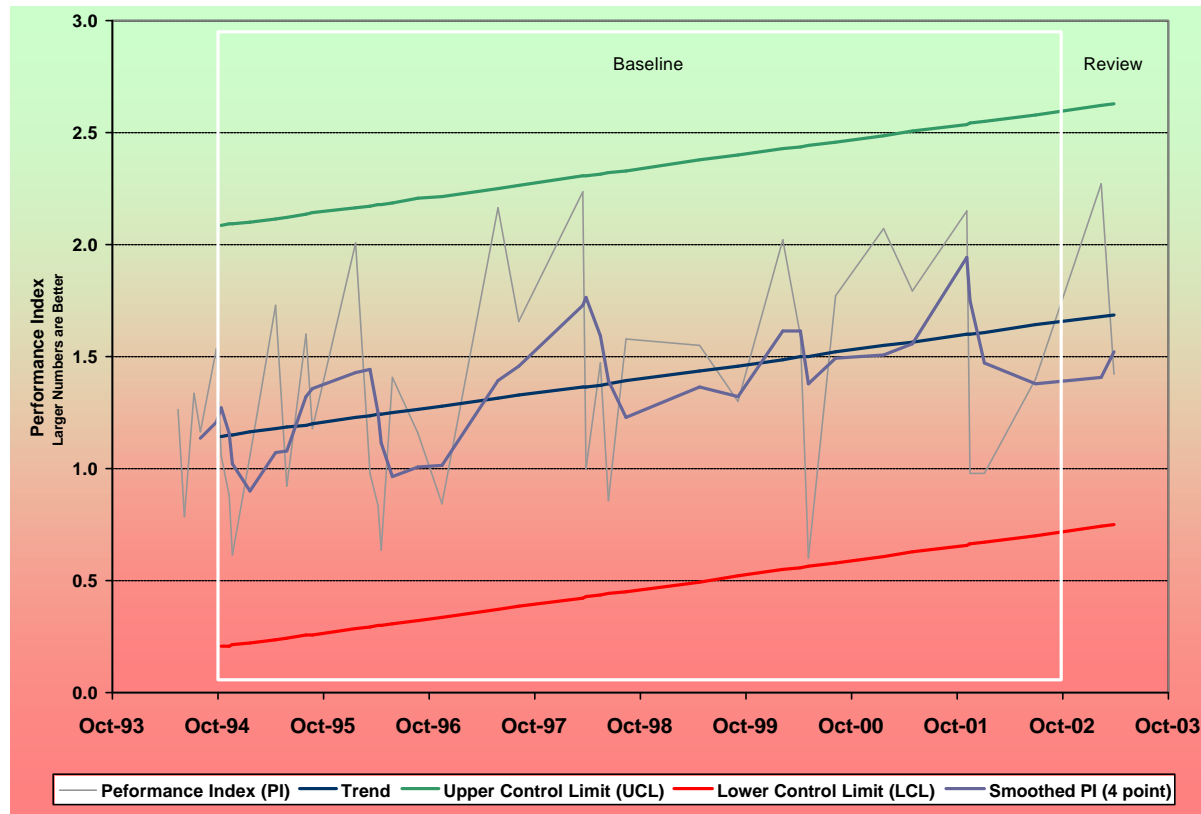
Fires/Explosions Control Chart
(1/94 to 4/24/03)

- 42 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 6 events
  - Baseline: 34 events
  - Review: 2 events

| Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

LANL Fall Protection Occurrence Performance

Fall Protection Control Chart
(2/8/96 to 4/24/03)

- 22 total events severity weighted 2, 3, or 4
  - Baseline: 20 events
  - Review: 2 events

| Review Period Score	
🟨	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟥	Annualized Rate
N/A	Control Limit
🟥	**OVERALL SCORE**

Direct Causes of LANL Fall Protection Occurrences
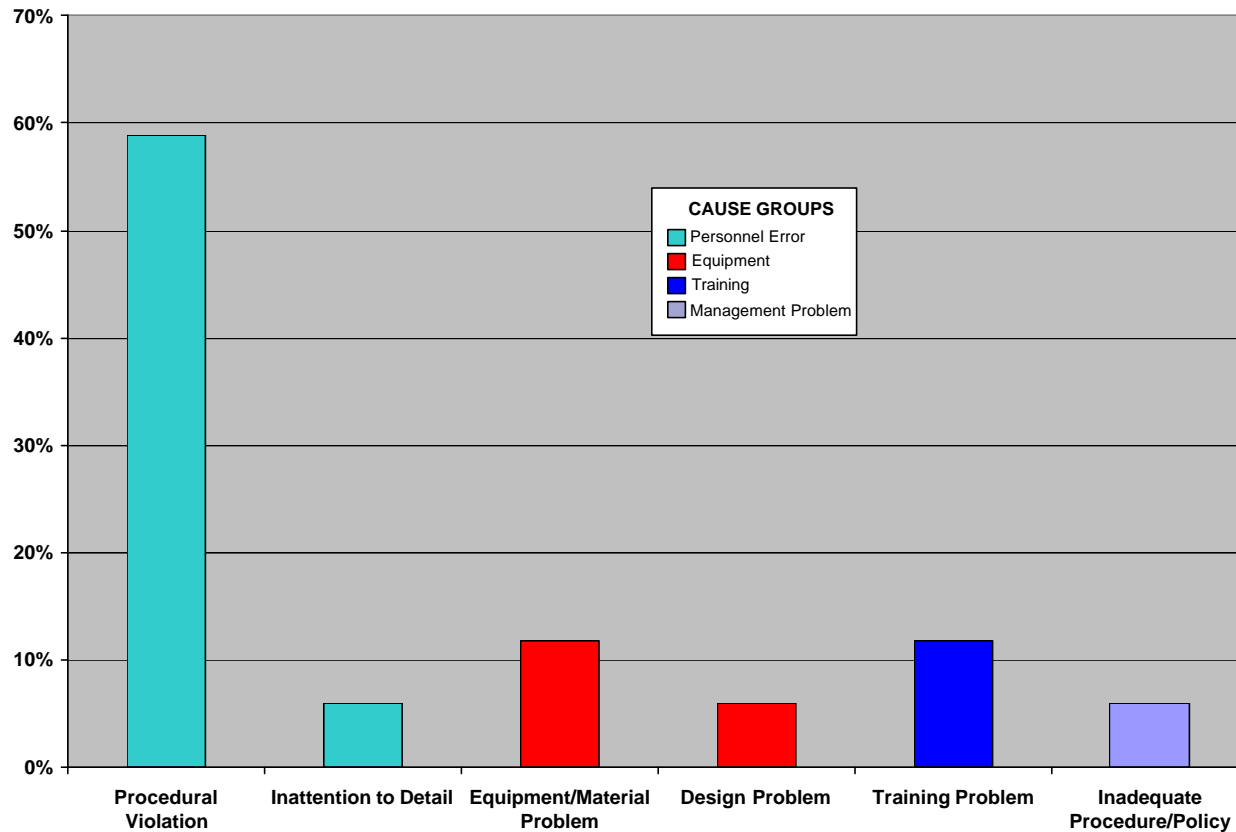
Direct Causes
Baseline and Review

• Personnel Error is the direct cause of about 65% of all fall protection events
• Most of the personnel errors involve violations of procedure
• Equipment Problem identified as direct cause in nearly 20% of fall protection events

Root Causes of LANL Fall Protection Occurrences
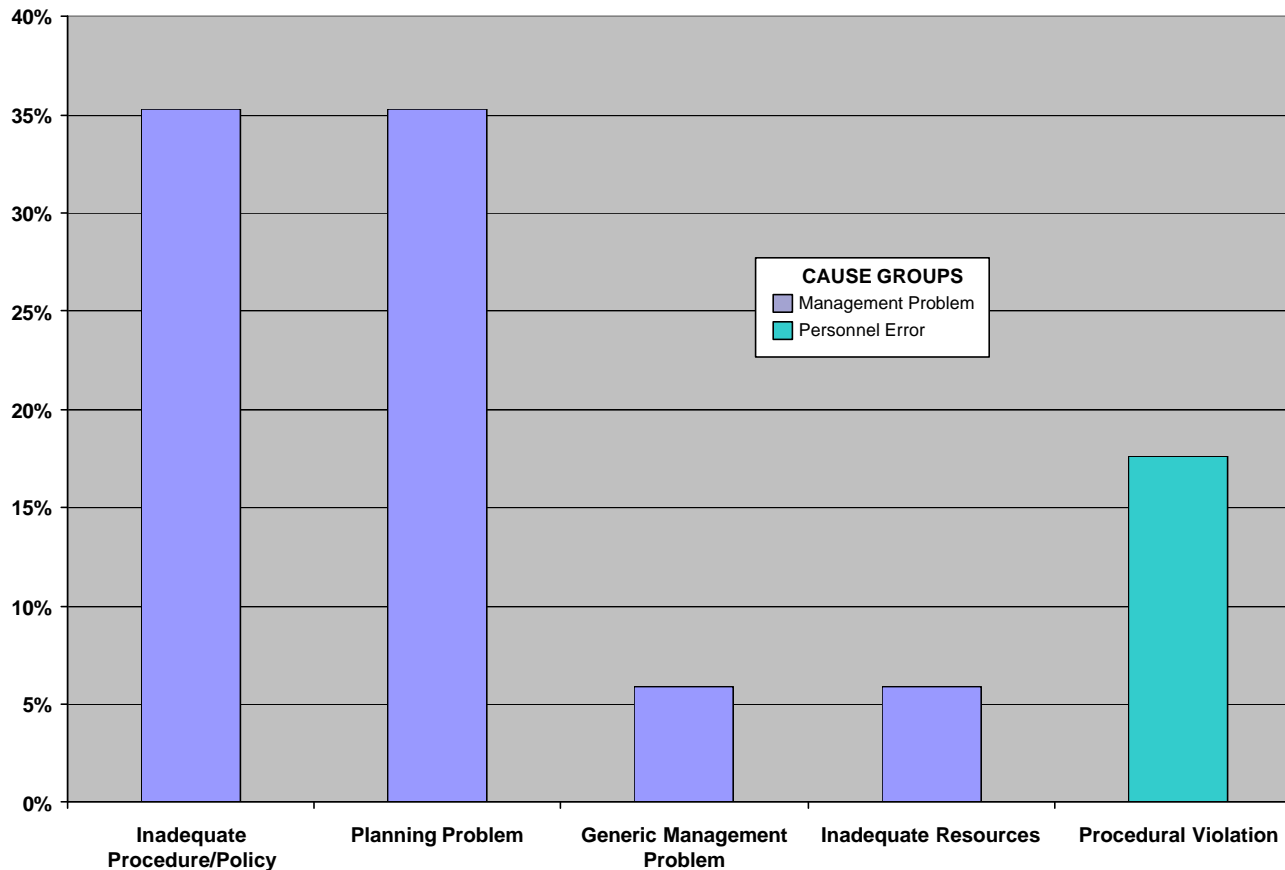
Root Causes
Baseline and Review

• Inadequate procedures and planning problems predominant root causes—about 70% of fall protection events

• Procedural violations account for about 18% of root causes for fall protection events

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Profile of Corrective Actions for LANL Fall Protection Occurrences
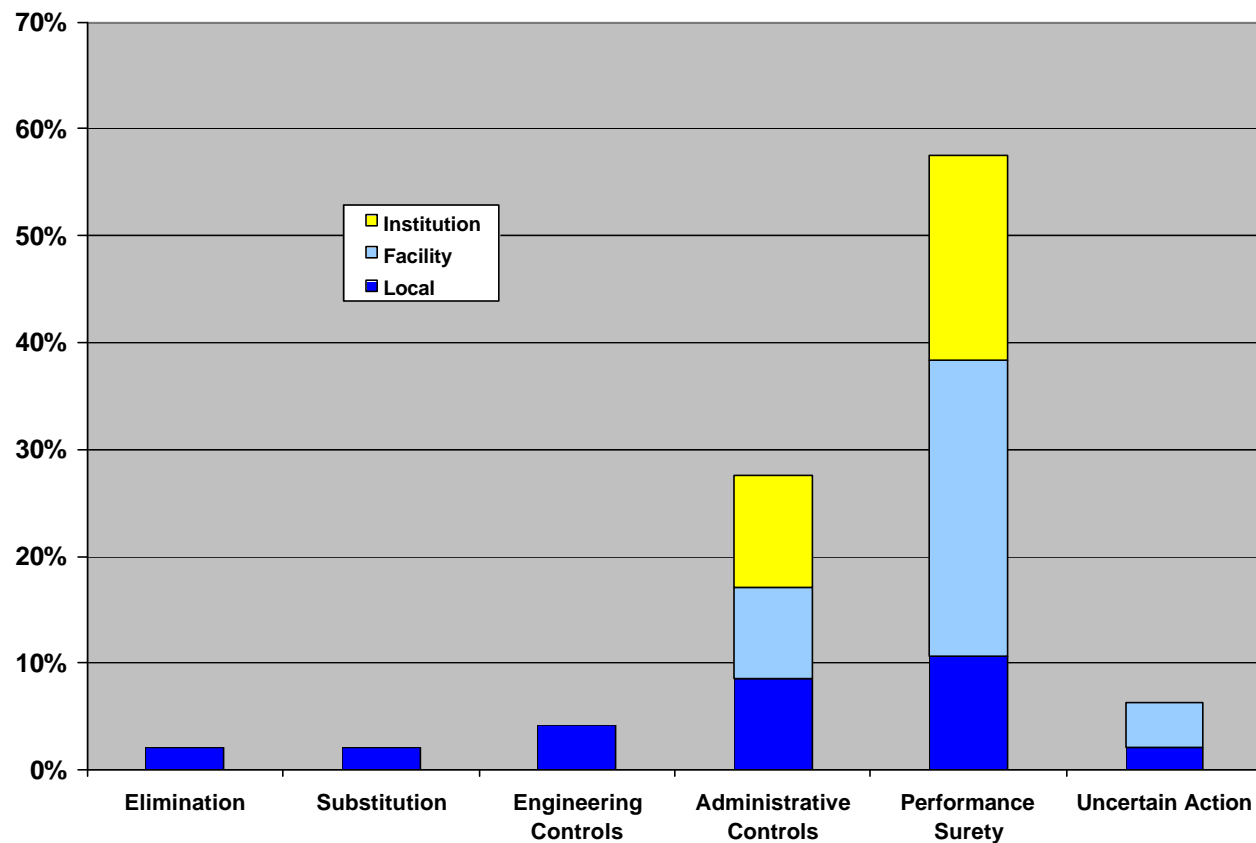
Corrective Actions
(10/01/97 to Present)

• Less than 5% of actions target eliminating or substituting for lesser hazard
• Less than 5% specify new or modified engineering barriers
• About 85% of all actions are administrative in nature—28% involve procedural changes and 57% "performance surety"
• 30% of actions targeted at institutional level

Performance Surety Actions for LANL Fall Protection Occurrences
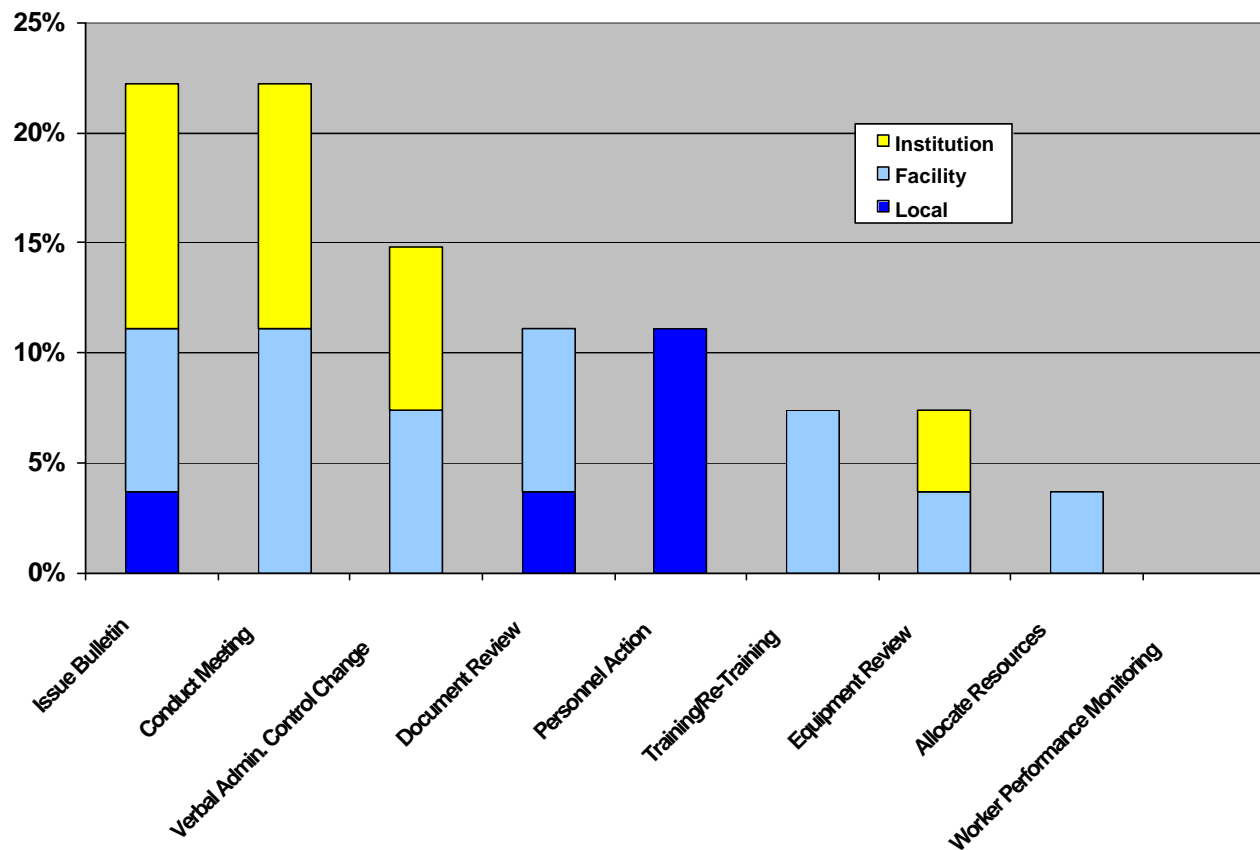
Performance Surety Actions
(10/01/97 to Present)

• Most performance surety actions involve reactive, one-time actions—meetings, bulletins, single training, document or equipment reviews, etc.
• No actions involve active worker performance monitoring
• 33% of performance surety actions targeted at institutional level

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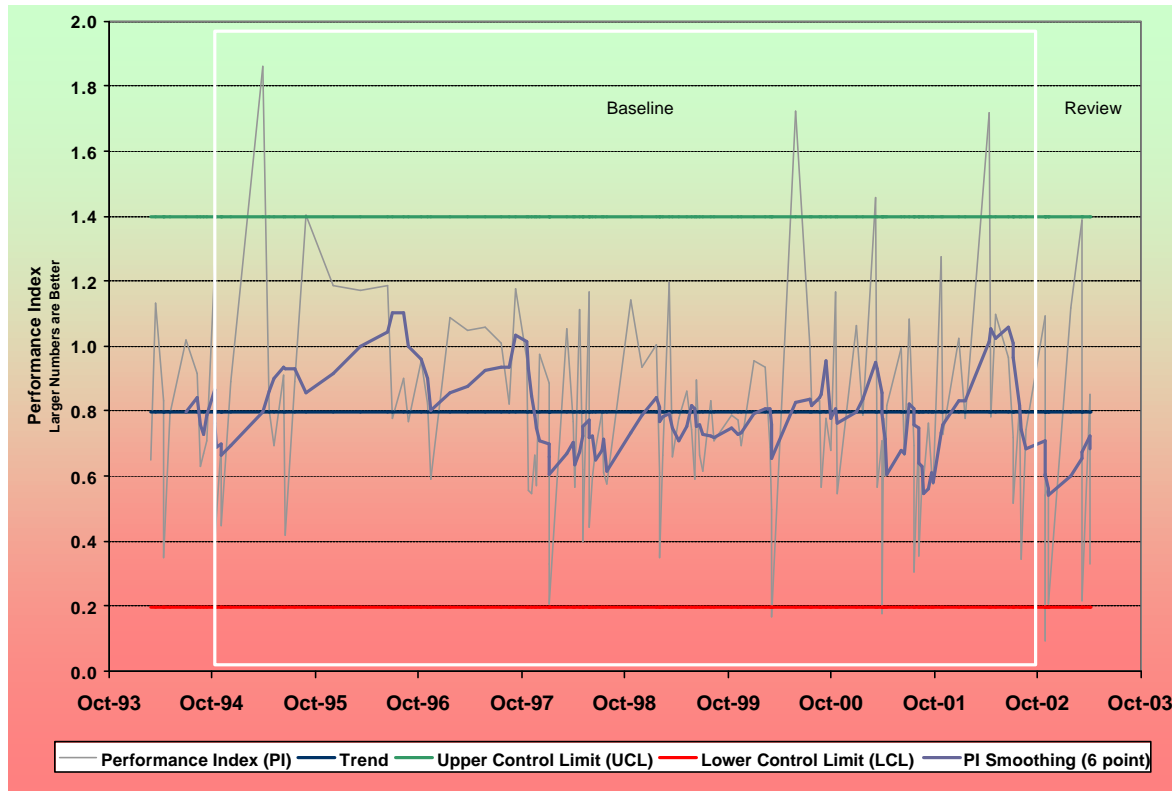# Authorization Basis Occurrences

FY2003

(6 month)

Los Alamos

LANL Authorization Basis Occurrence Performance

Authorization Basis PI Control Chart
(1/94 to 4/24/03)
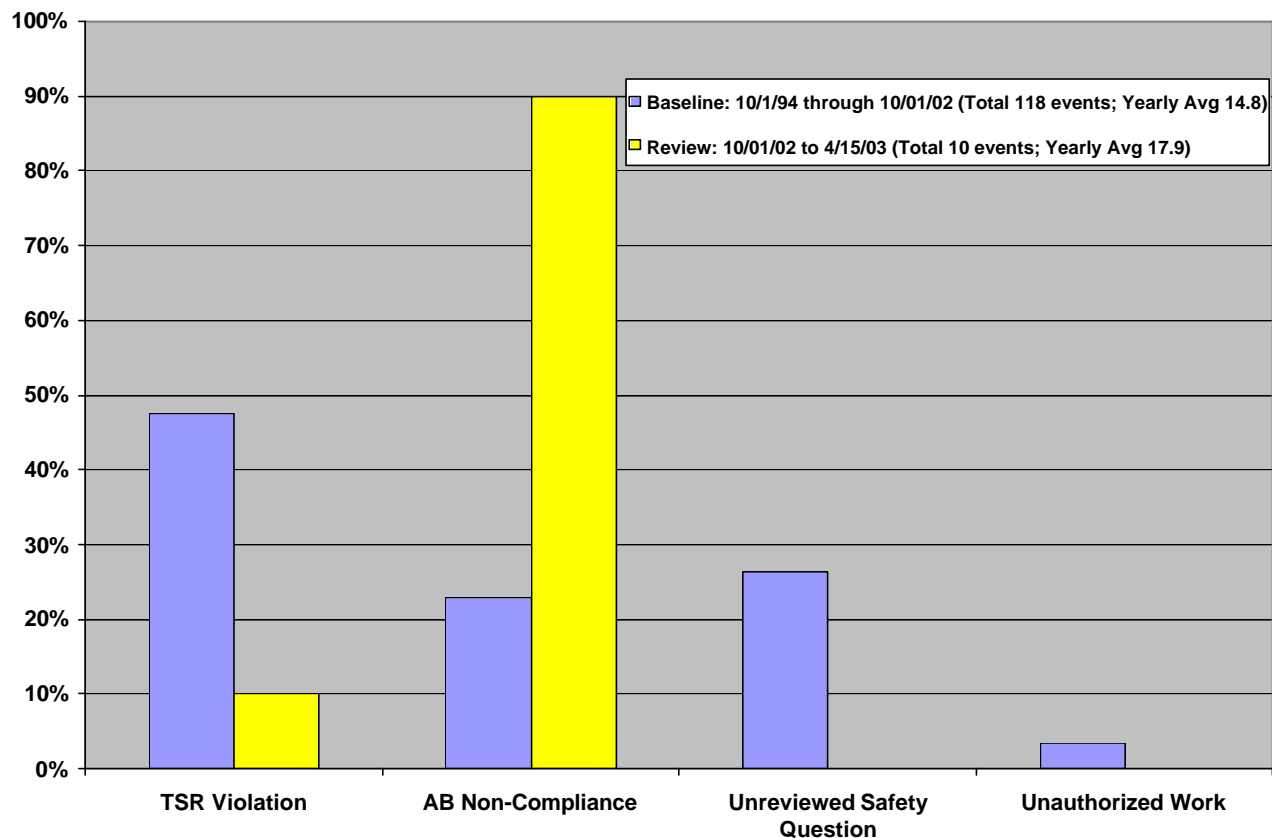
- 139 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 11 events
  - Baseline: 118 events
  - Review: 10 events

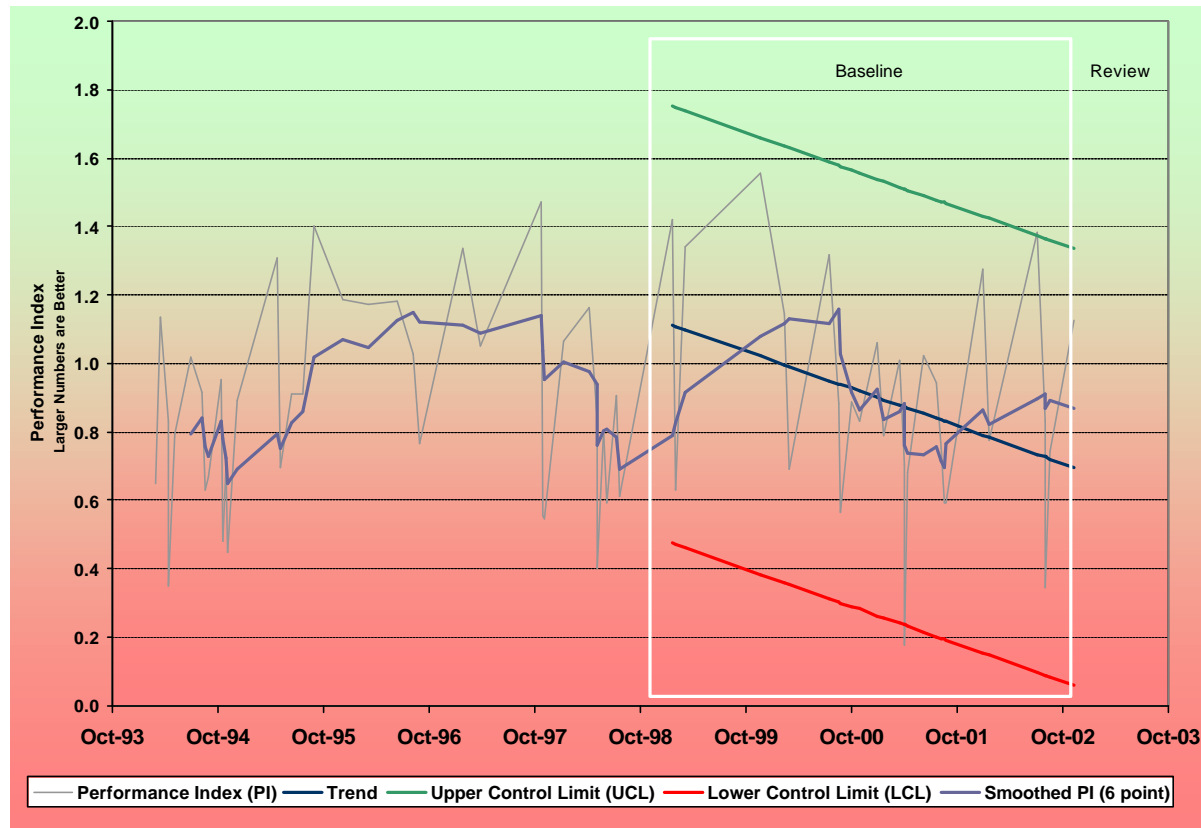| Review Period Score	
🟨	Sustained Performance
🟨	Review Period Trend
🟥	Over/Under Trend
🟥	Annualized Rate
🟥	Control Limit
🟥	**OVERALL SCORE**

Type Distribution of LANL Authorization Basis Occurrences

Authorization Basis Occurrences by Type
Baseline vs. Review

• TSR Violations decrease from 47% in baseline period to 10% of review period

• Emergence of AB Non-compliance as predominant type in review period with 90% of total

Legend:
- Baseline: 10/1/94 through 10/01/02 (Total 118 events; Yearly Avg 14.8)
- Review: 10/01/02 to 4/15/03 (Total 10 events; Yearly Avg 17.9)

Categories: TSR Violation, AB Non-Compliance, Unreviewed Safety Question, Unauthorized Work

LANL TSR Violation Occurrence Performance

TSR Violation Control Chart
(1/94 to 4/24/03)

• 67 total events severity weighted 2 or 3. No high severity (level 4) events

   • Pre-Baseline: 38 events
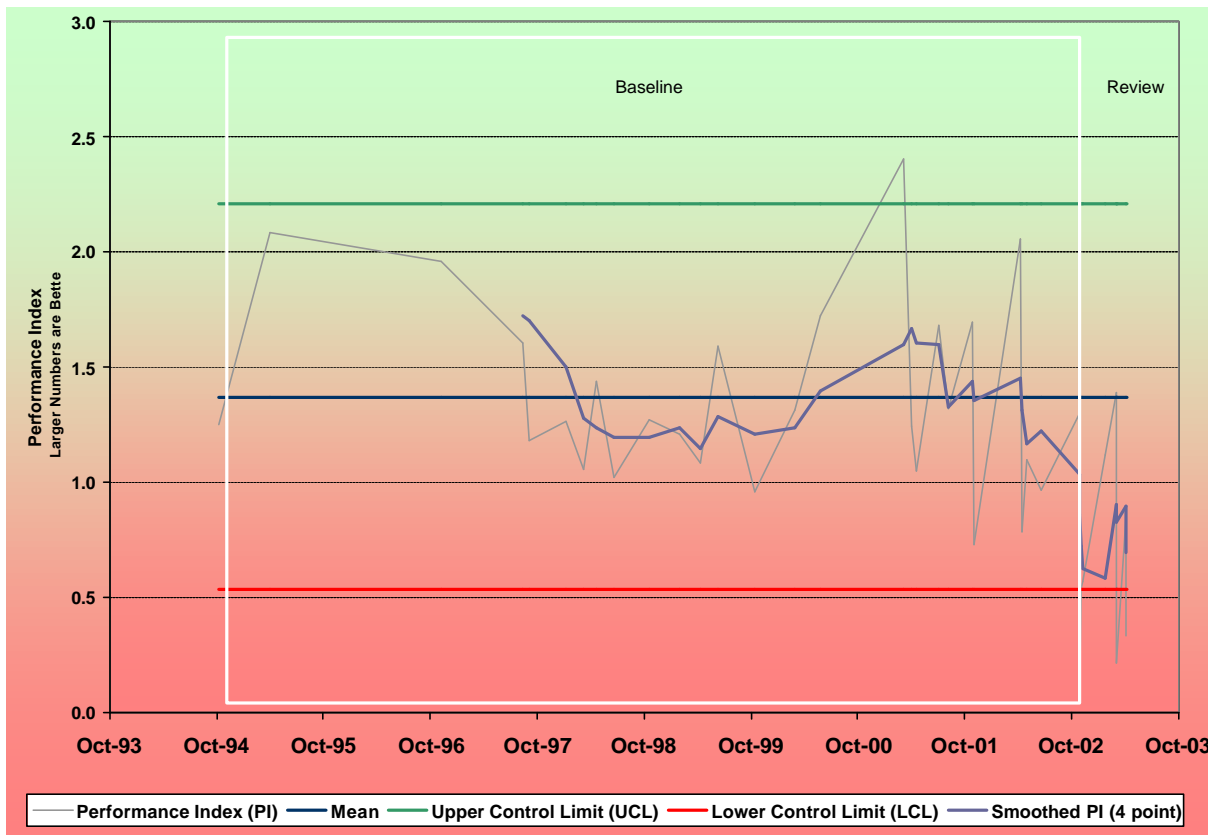
   • Baseline: 28 events

   • Review: 1 events

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

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LANL AB Non-Compliance Occurrence Performance

AB Non-Compliance Control Chart
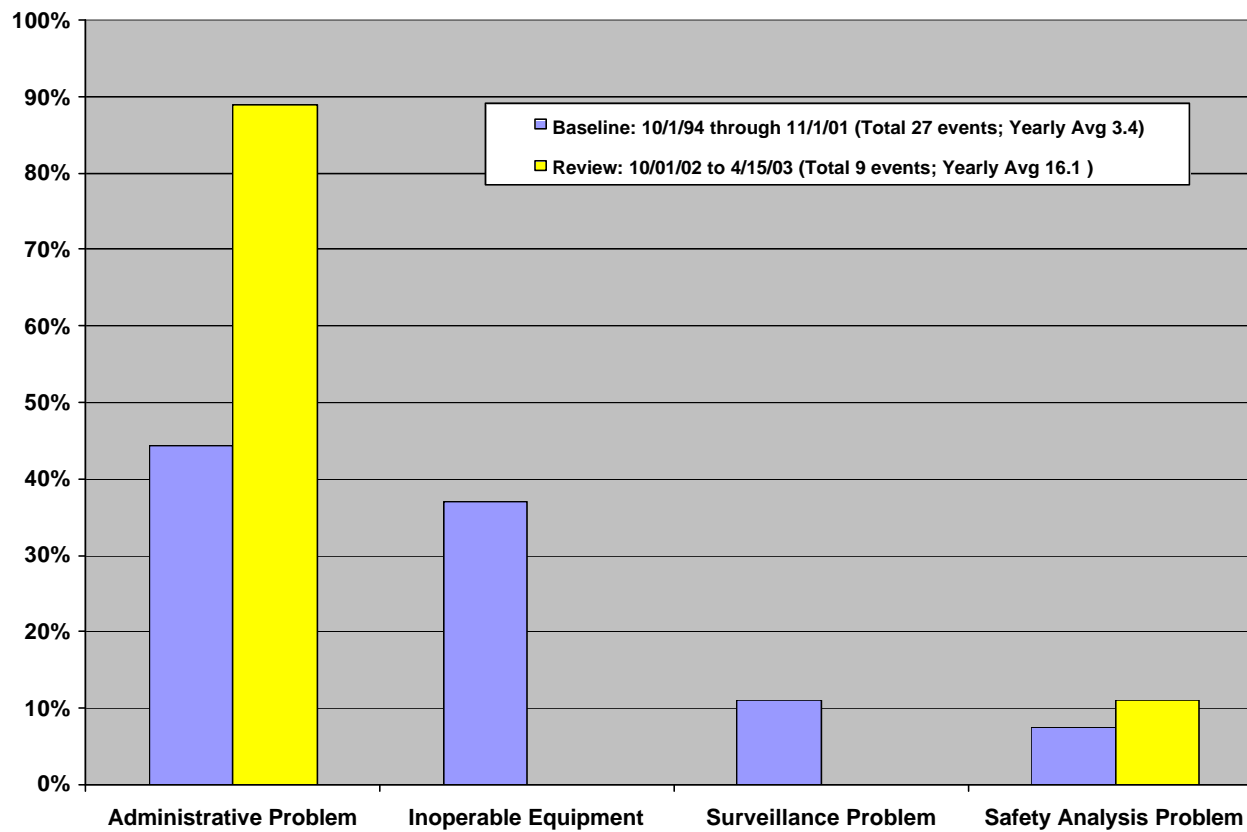(1/94 to 4/24/03)

- 36 total events severity weighted 2, 3, or 4.
  - Baseline: 27 events
  - Review: 9 events

Review Period Score	
🟥	Sustained Performance
N/A	Review Period Trend
🟥	Over/Under Trend
🟥	Annualized Rate
🟥	Control Limit
🟥	OVERALL SCORE

Chart legend: Performance Index (PI) — Mean — Upper Control Limit (UCL) — Lower Control Limit (LCL) — Smoothed PI (4 point)

Y-axis: Performance Index, Larger Numbers are Better (0.0 to 3.0)

X-axis: Oct-93 to Oct-03
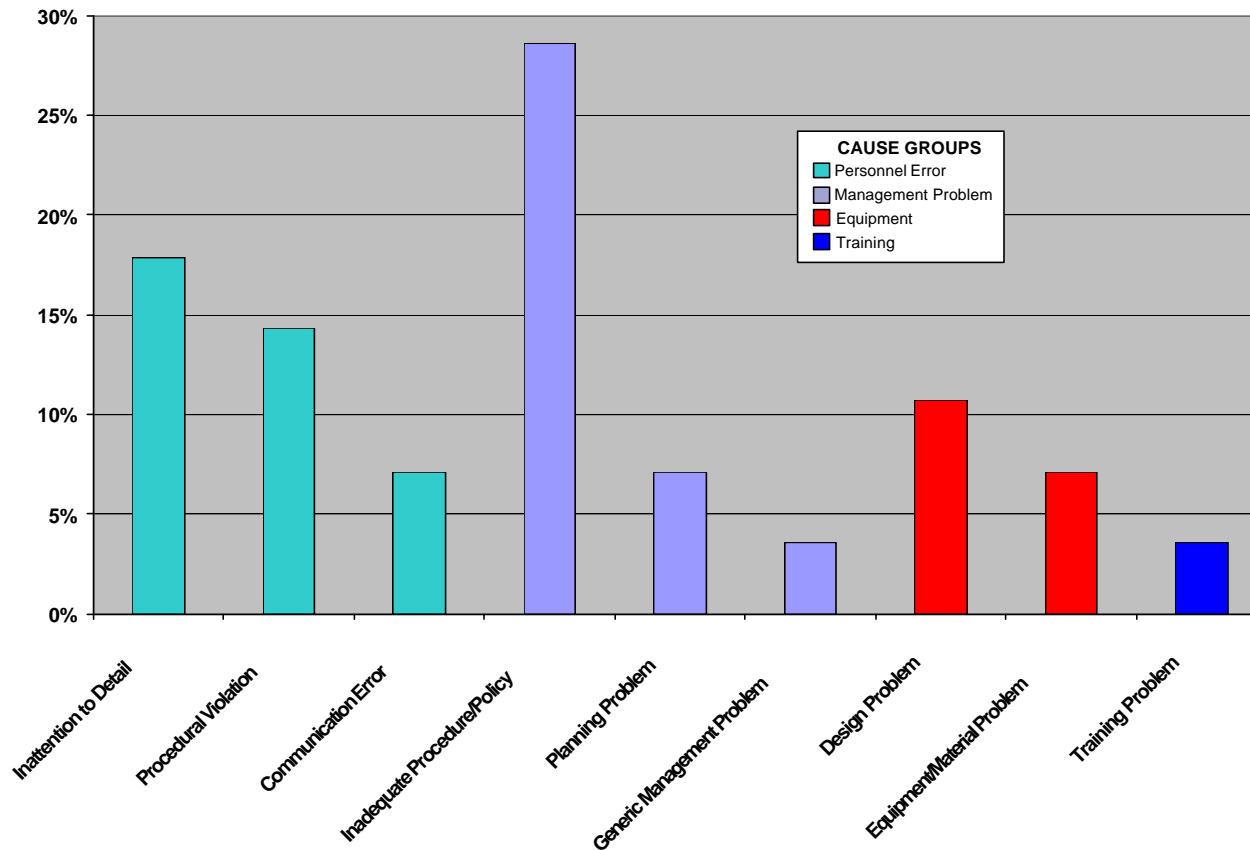
Baseline / Review

Los Alamos

Type Distribution of LANL AB Noncompliances

AB Noncompliance Occurrences by Type
Baseline vs. Review

- Administrative Problem increases from 44% of baseline to almost 90% of review period

- Safety Analysis Problem remains static at about 10% of total

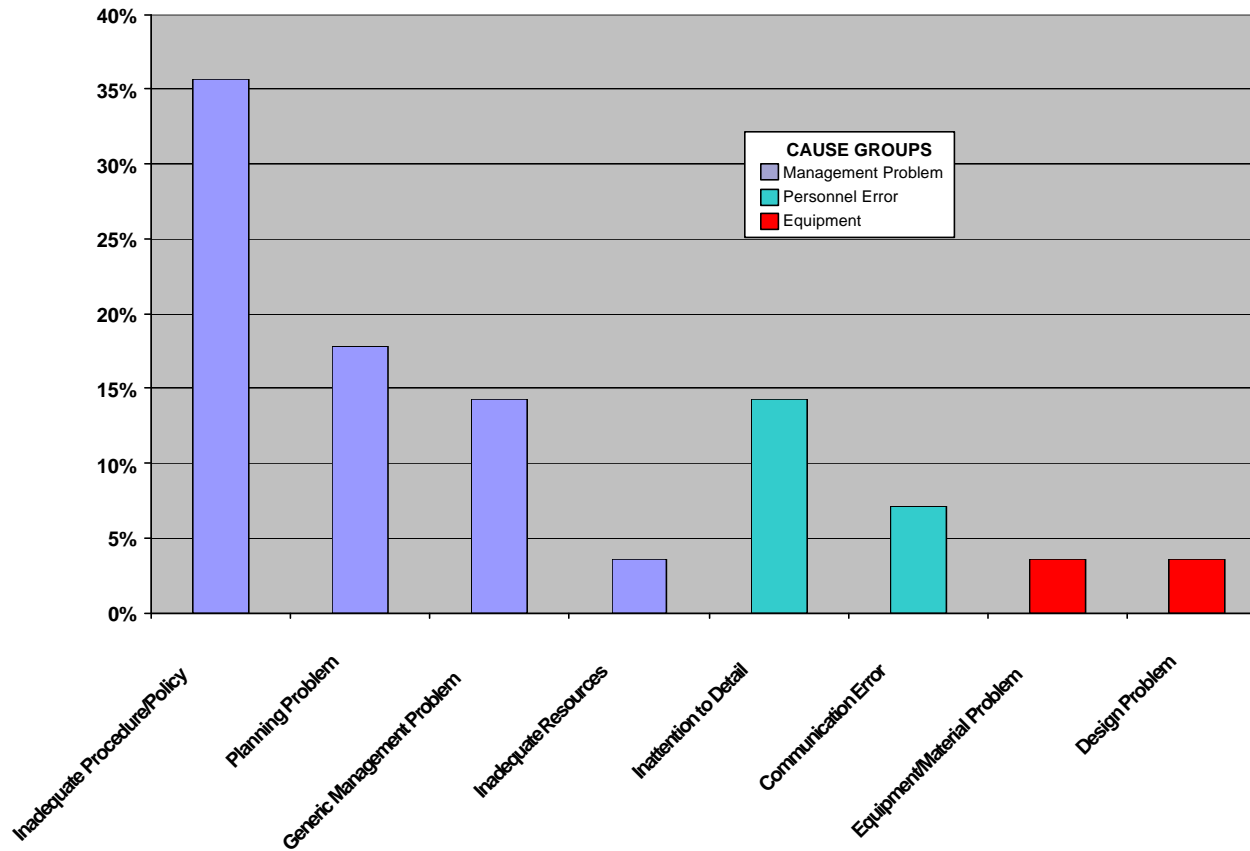- Disappearance of other AB types in review period

Chart legend:
- Baseline: 10/1/94 through 11/1/01 (Total 27 events; Yearly Avg 3.4)
- Review: 10/01/02 to 4/15/03 (Total 9 events; Yearly Avg 16.1)

Categories (x-axis): Administrative Problem, Inoperable Equipment, Surveillance Problem, Safety Analysis Problem

Los Alamos

Direct Causes of LANL AB Non-Compliances

Direct Causes
Baseline and Review

• Personnel Error and Management Problem are predominant direct causes of AB Noncompliances—about 40% for each cause group

• Inadequate procedures account for the direct cause of about 29% of events

Los Alamos

Root Causes of LANL AB Non-Compliances

CAUSE GROUPS
- Management Problem
- Personnel Error
- Equipment

Chart categories (x-axis): Inadequate Procedure/Policy, Planning Problem, Generic Management Problem, Inadequate Resources, Inattention to Detail, Communication Error, Equipment/Material Problem, Design Problem

Root Causes
Baseline and Review

• Principal root causes for AB Non-Compliances involve inadequate procedures, planning problems, and personnel errors

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Profile of Corrective Actions for LANL AB Non-Compliances
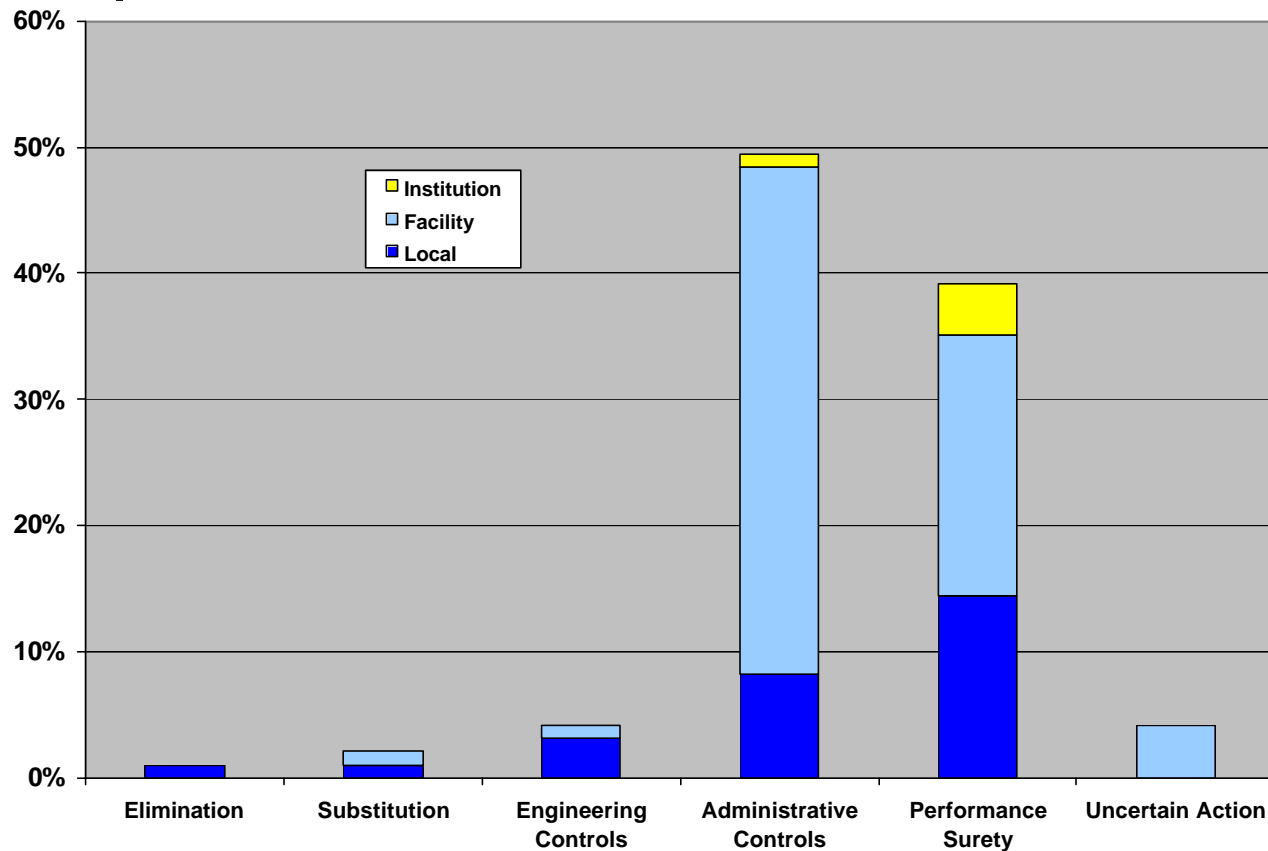
Corrective Actions
(10/97 to Present)

• Nearly 90% of the corrective actions are administrative in nature—50% involve new or modified procedures with 39% being "performance surety" type actions
• Most actions at facility level
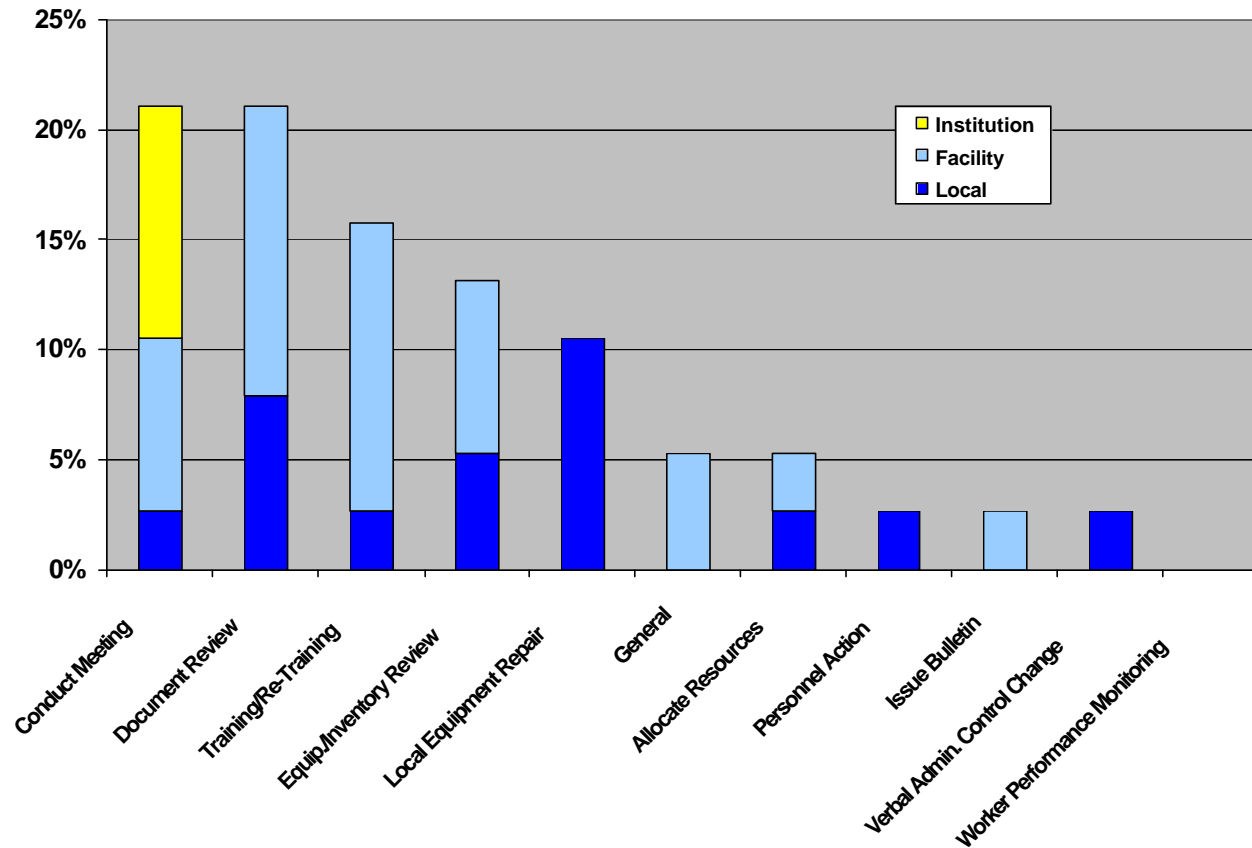• About 5% of actions at institutional level

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Administrative Control Actions for LANL AB Non-Compliances
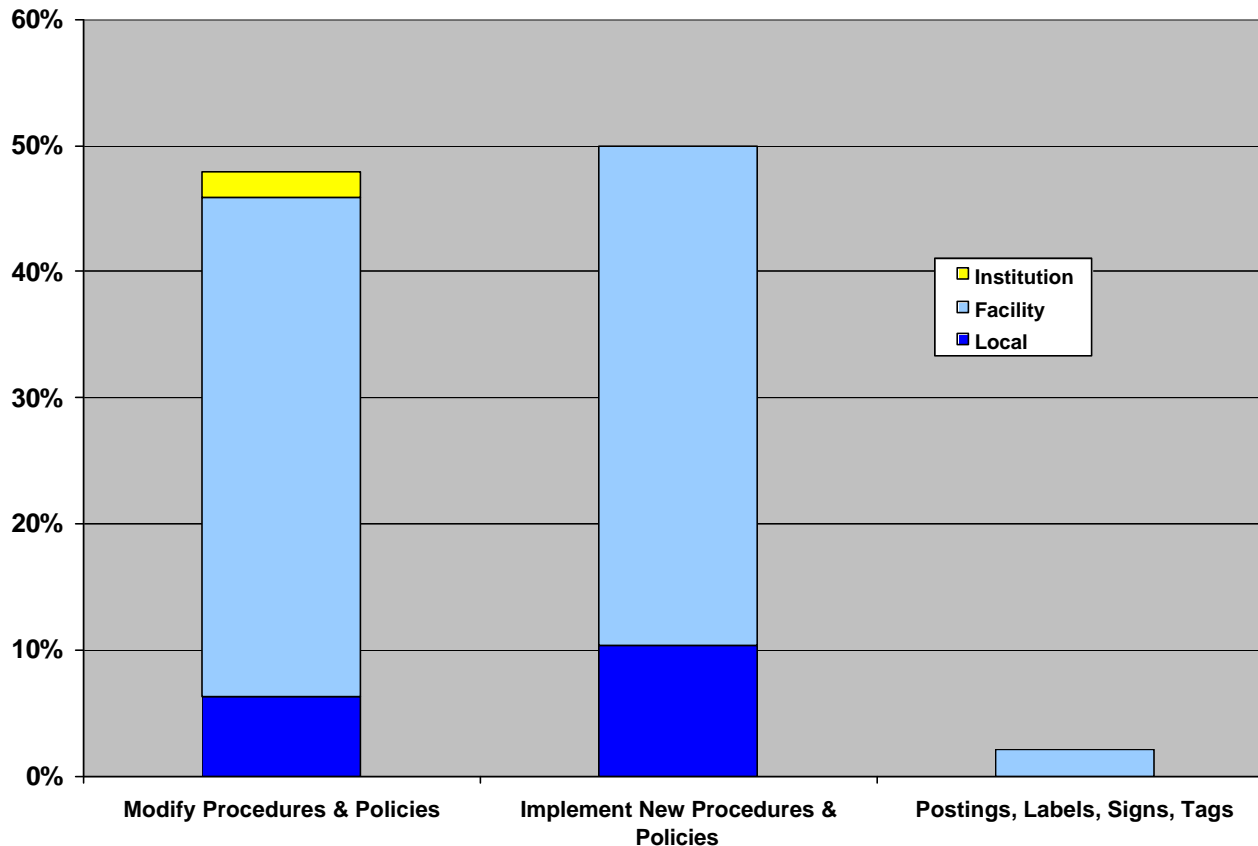
Administrative Control Actions (10/97 to 4/24/03)

• 50% of the administrative actions involve implementing new procedures and policies
• About 81% of actions at facility level
• 2% involve institutional administrative control actions

Legend:
- Institution
- Facility
- Local

Chart categories:
- Modify Procedures & Policies
- Implement New Procedures & Policies
- Postings, Labels, Signs, Tags

Los Alamos

Performance Surety Actions for LANL AB Non-Compliances

Performance Surety Actions
(10/97 to 4/24/03)

• Nearly 85% of performance surety actions involve reactive, one-time actions—equipment reviews and repairs, meetings, and stand-alone training

• No institutional actions for equipment or document reviews

• No actions involving active worker performance monitoring

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Property or Equipment Occurrences
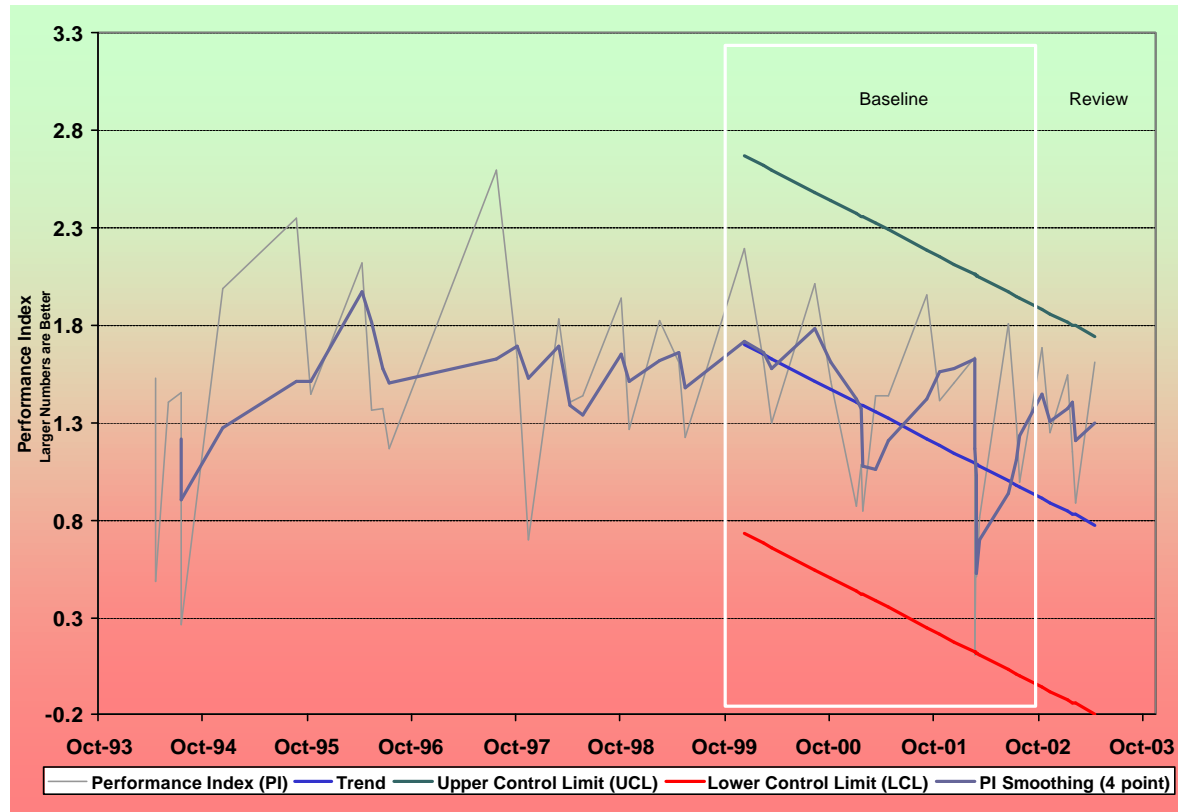
FY2003
(6 month)

LANL Damaged or Counterfeit Property Occurrence Performance

Damaged/Counterfeit Property PI Control Chart
(1/94 to 4/24/03)

- 52 total events severity weighted 2 or 4. No severity level 3 events.
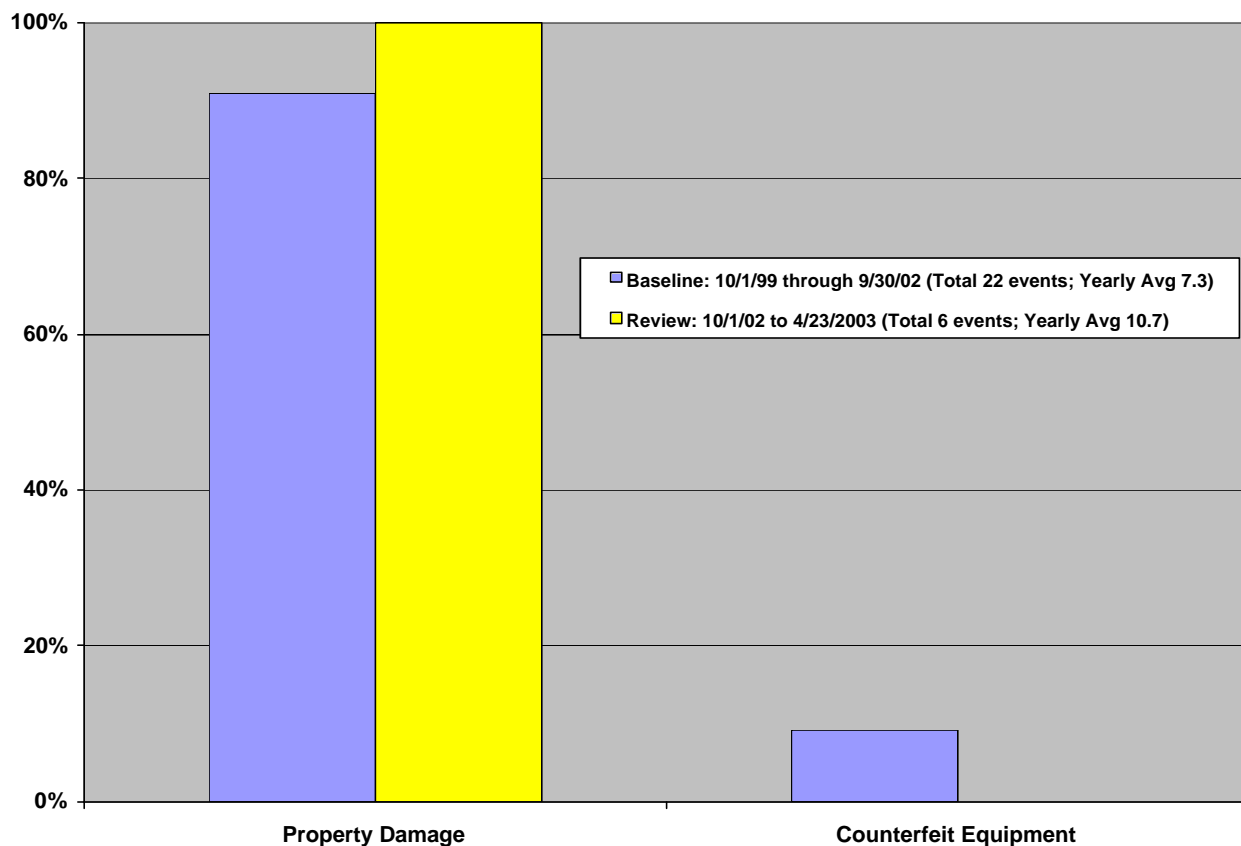
  - Pre-Baseline: 24 events

  - Baseline: 22 events

  - Review: 6 events

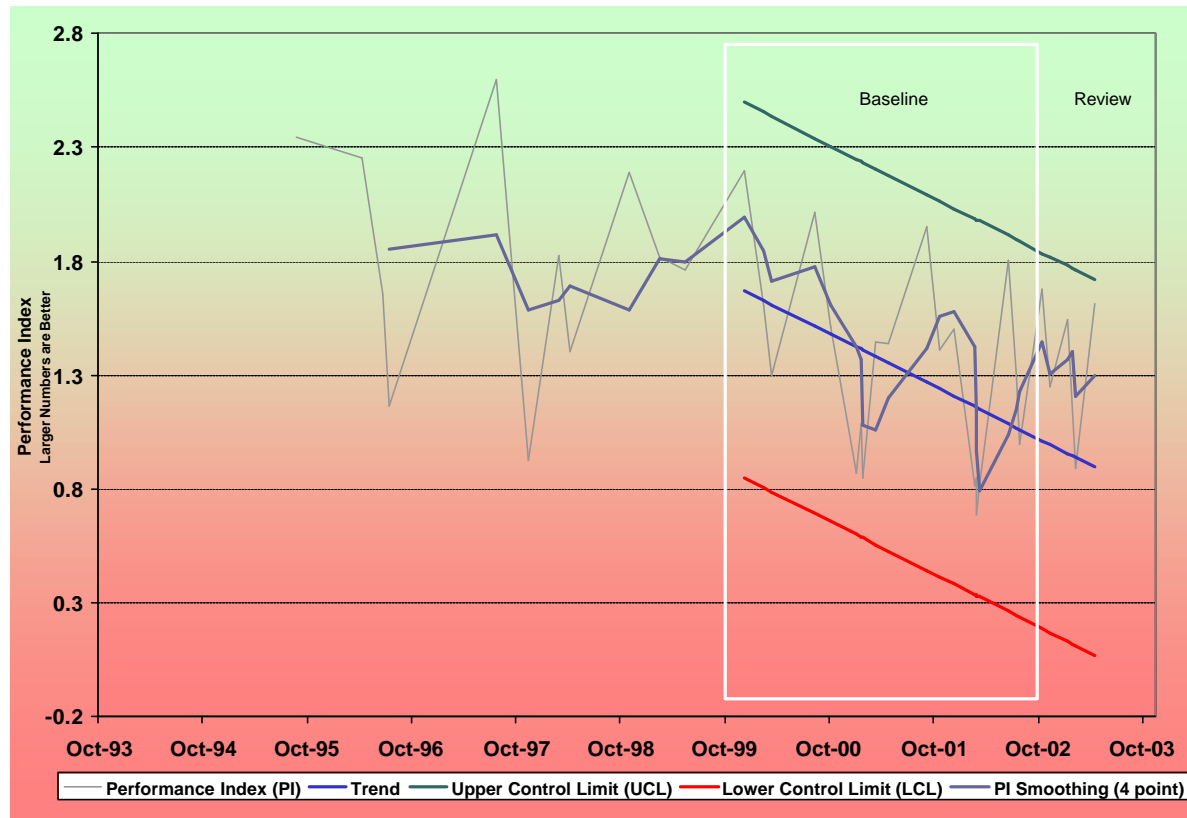| Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
🟩	**Over/Under Trend**
🟥	**Annualized Rate**
N/A	**Control Limit**
🟨	**OVERALL SCORE**

Type Distribution of LANL Damaged or Counterfeit Property Occurrences

Damaged or Counterfeit Property Occurrences by Type
Baseline vs. Review

Baseline: 10/1/99 through 9/30/02 (Total 22 events; Yearly Avg 7.3)

Review: 10/1/02 to 4/23/2003 (Total 6 events; Yearly Avg 10.7)

- Property Damage is the predominant type—over 90% in baseline to 100% in review

- Review to focus on Property Damage events

LANL Property Damage Occurrence Performance

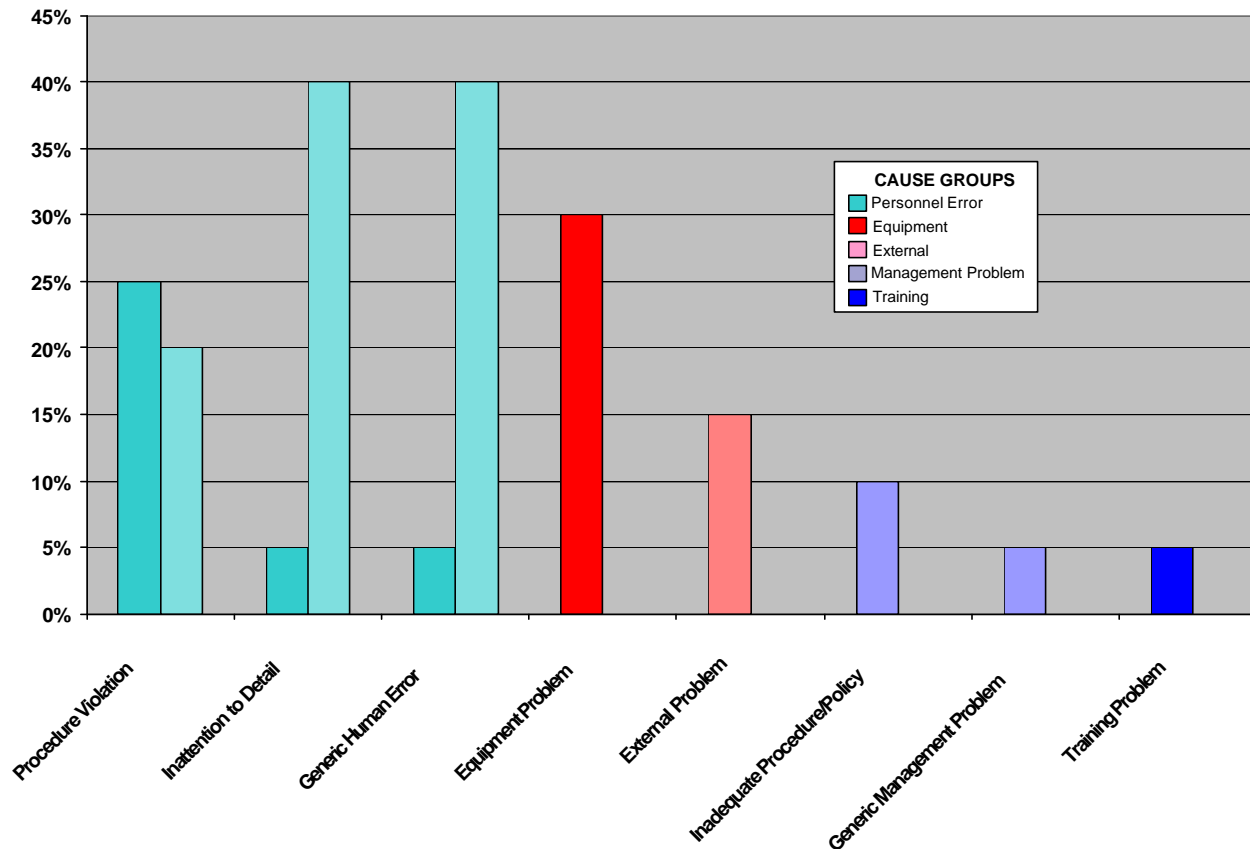**Property Damage Control Chart**
(1/94 to 4/24/03)

- 38 total events severity weighted 2 or 4

  - Pre-Baseline: 12 events

  - Baseline: 20 events

  - Review: 6 events

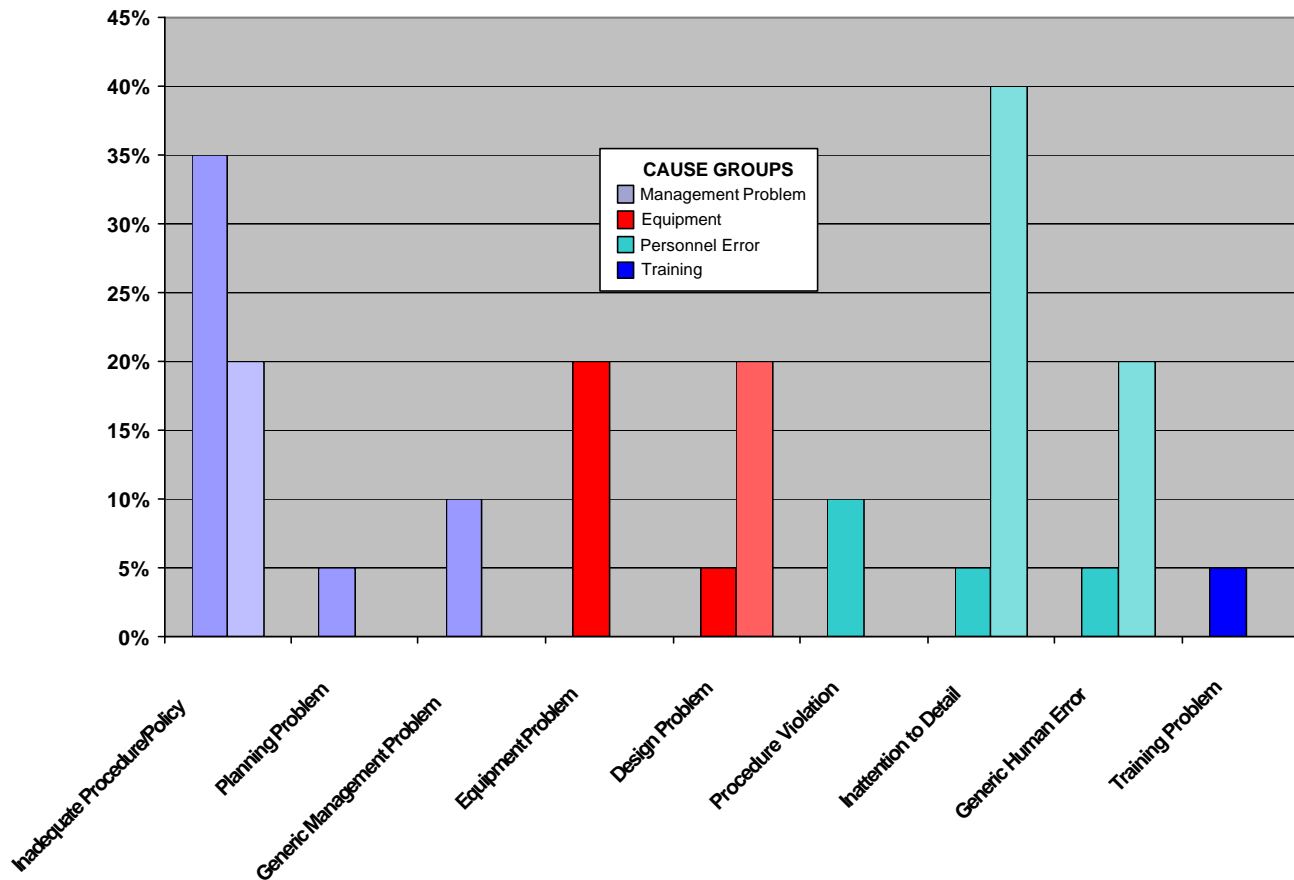| Review Period Score	
☐ (yellow)	**Sustained Performance**
N/A	**Review Period Trend**
☐ (green)	**Over/Under Trend**
☐ (red)	**Annualized Rate**
N/A	**Control Limit**
☐ (yellow)	**OVERALL SCORE**

Los Alamos

Direct Causes of LANL Property Damage Occurrences

Direct Causes
Baseline vs. Review

• Personnel Error is the primary direct cause in baseline and review periods
• Disappearance of other causal groups in review period—Equipment Problem, Management Problem, and Training
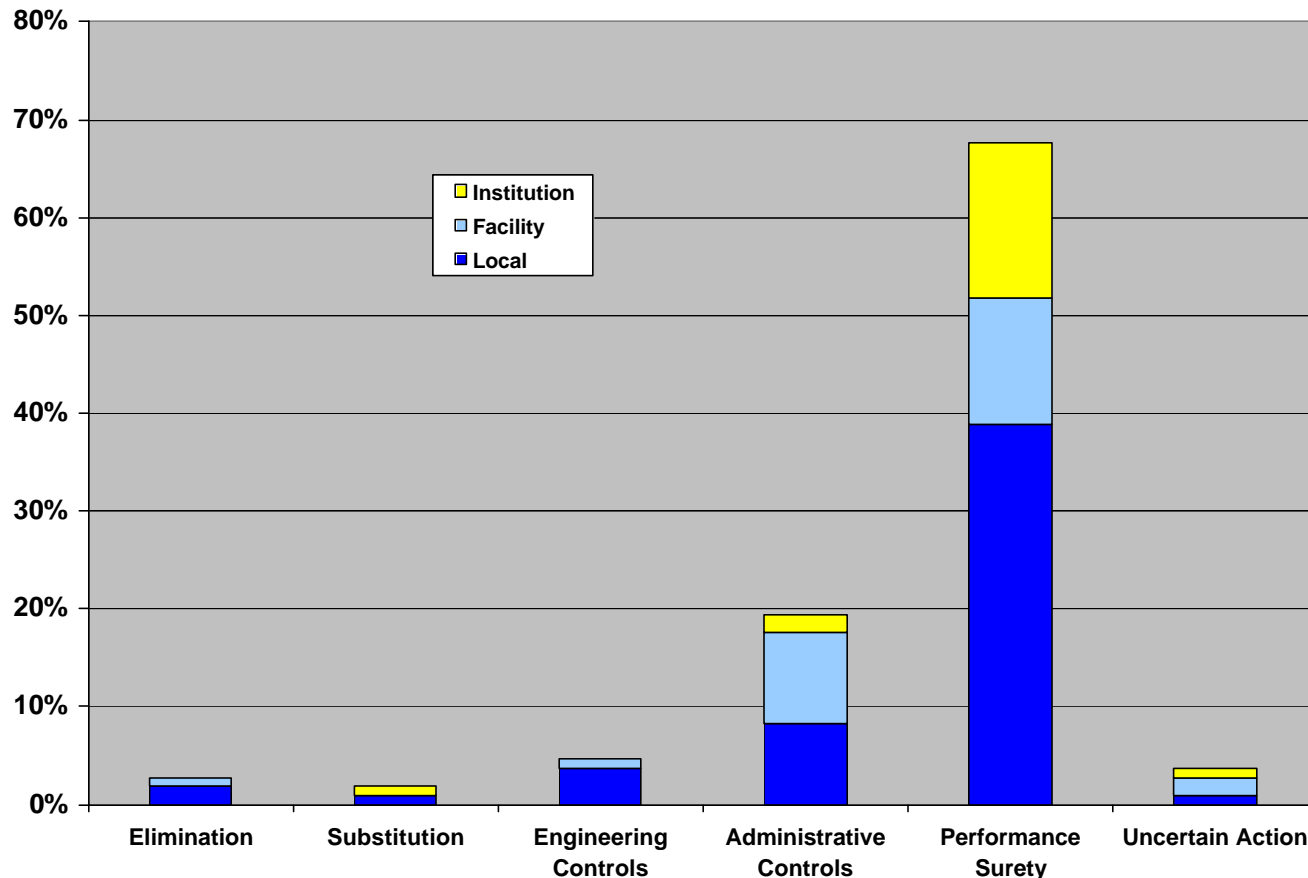
CAUSE GROUPS
- Personnel Error
- Equipment
- External
- Management Problem
- Training

Root Causes of LANL Property Damage Occurrences

Root Causes
Baseline vs. Review

• Primary root causes in baseline period are Inadequate Procedures and Equipment Problems

• Emergence of Personnel Error as predominant root cause in review period with 60% of total

CAUSE GROUPS
- Management Problem
- Equipment
- Personnel Error
- Training

Chart categories: Inadequate Procedure/Policy, Planning Problem, Generic Management Problem, Equipment Problem, Design Problem, Procedure Violation, Inattention to Detail, Generic Human Error, Training Problem

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Profile of Corrective Actions for LANL Property Damage Occurrences

Corrective Actions (10/99 to 4/24/03)

• More than 85% of the corrective actions are administrative in nature—19% involve new or modified procedures with 68% being "performance surety" type actions
• About 20% of actions at institutional level

Performance Surety Actions for LANL Property Damage Occurrences
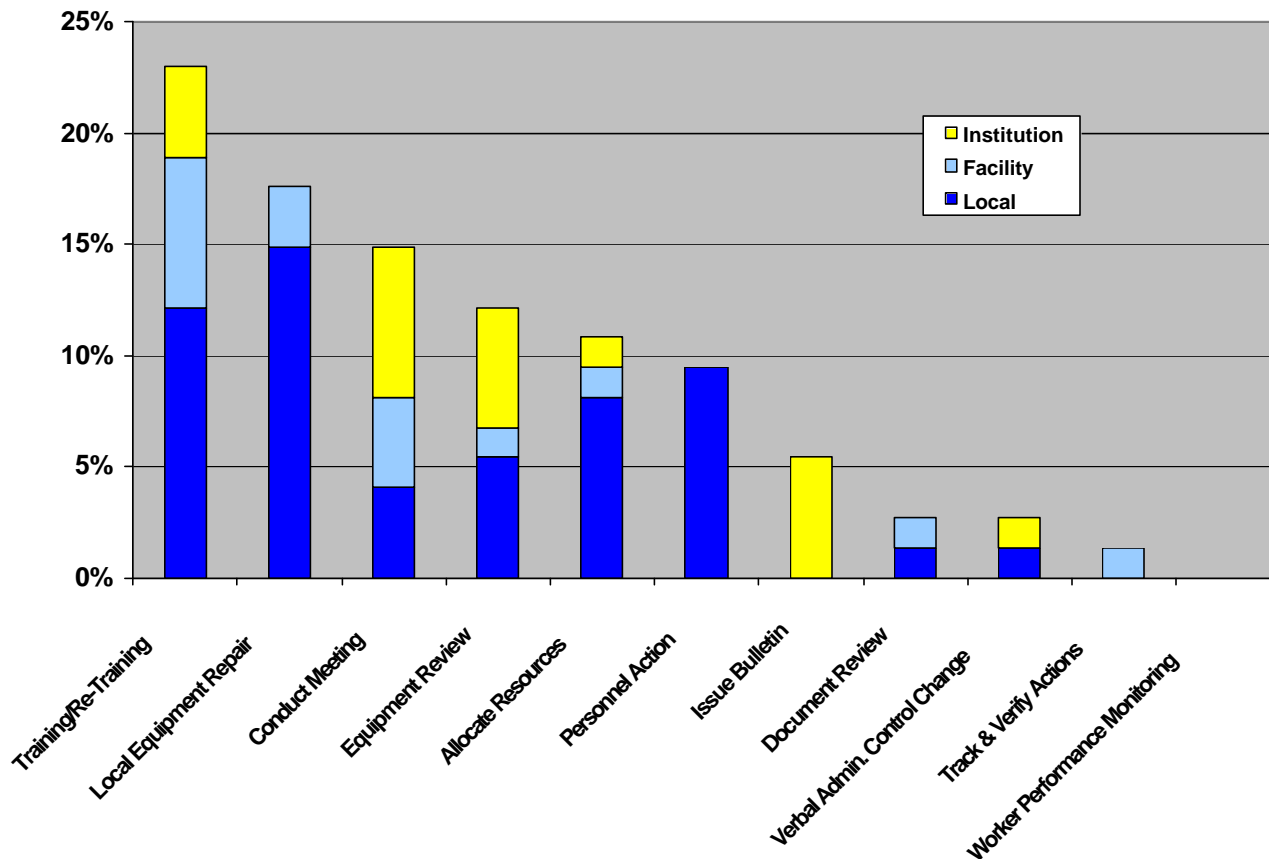
Performance Surety Actions
(10/99 to 4/24/03)

• About 80% of performance surety actions involve reactive, one-time actions—single training, immediate equipment repairs, meetings, disciplinary actions, reviews, etc.
• No actions involving worker performance monitoring

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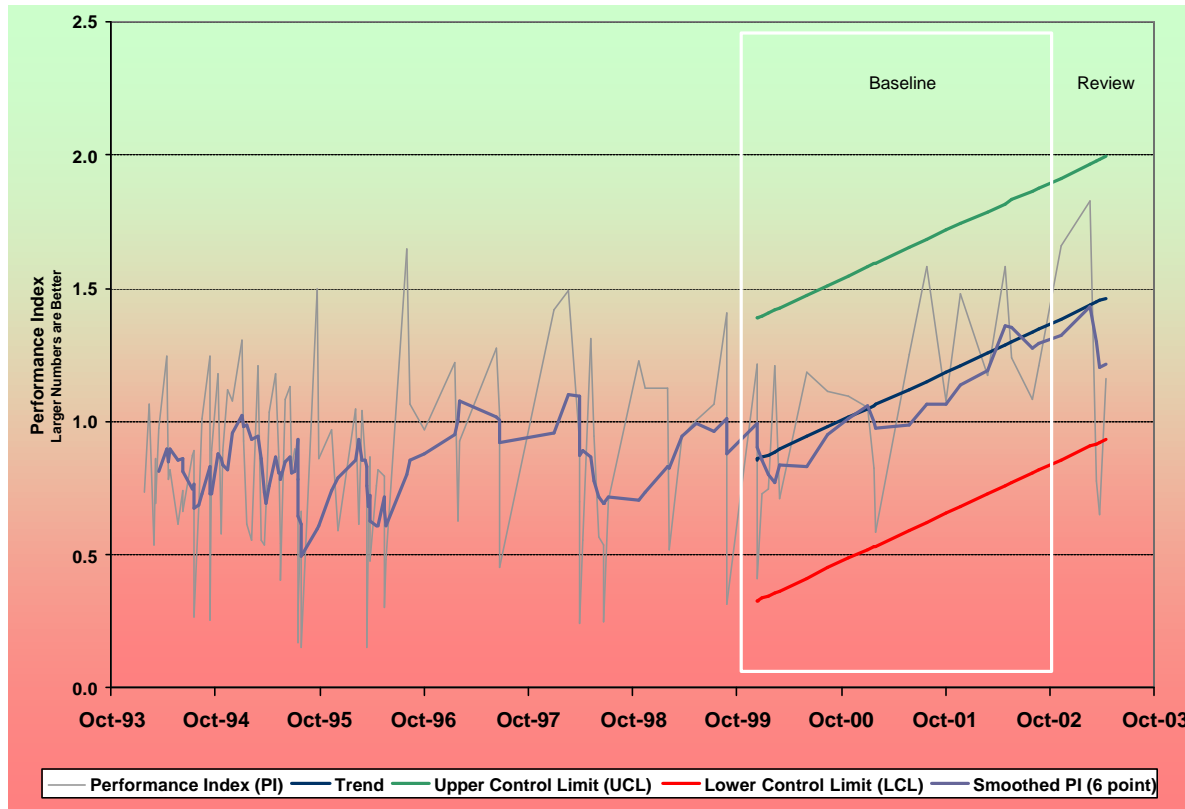# Environmental Protection Occurrences

FY2003

(6 month)

Los Alamos

LANL Environmental Protection Occurrence Performance

Environmental Protection PI Control Chart
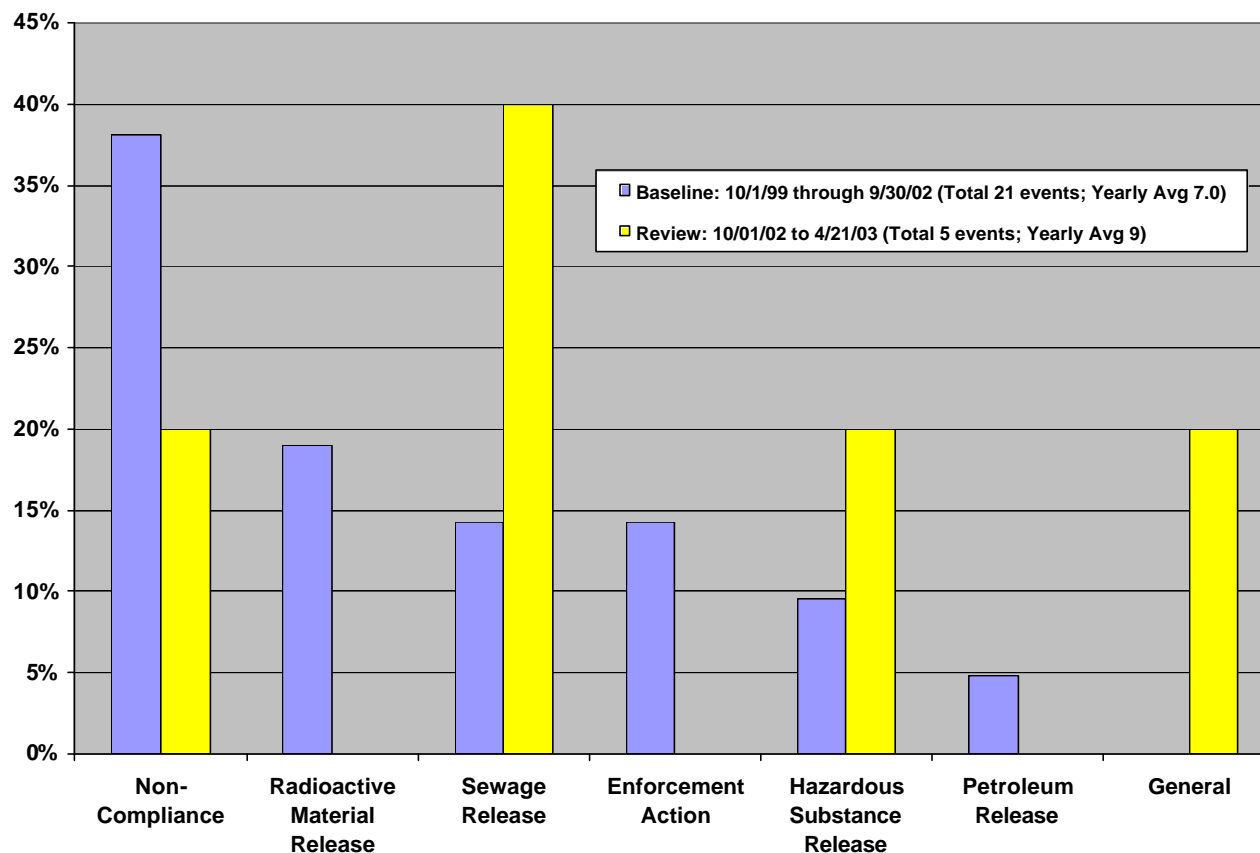(1/94 to 4/24/03)

123 total events severity weighted 2, 3, or 4

- Pre-Baseline: 97 events

- Baseline: 21 events

- Review: 5 events

Review Period Score	
	Sustained Performance
N/A	**Review Period Trend**
	Over/Under Trend
	Annualized Rate
	Control Limit
	OVERALL SCORE

Chart legend:
- Performance Index (PI)
- Trend
- Upper Control Limit (UCL)
- Lower Control Limit (LCL)
- Smoothed PI (6 point)

Type Distribution of LANL Environmental Protection Occurrences

Environmental Protection Occurrences by Type
Baseline vs. Review

• Reduction in predominant baseline types Noncompliance and Radioactive Material Release for review period

• Increase in Sewage Release, Hazardous Substance Release

LANL Sewage Release Occurrence Performance
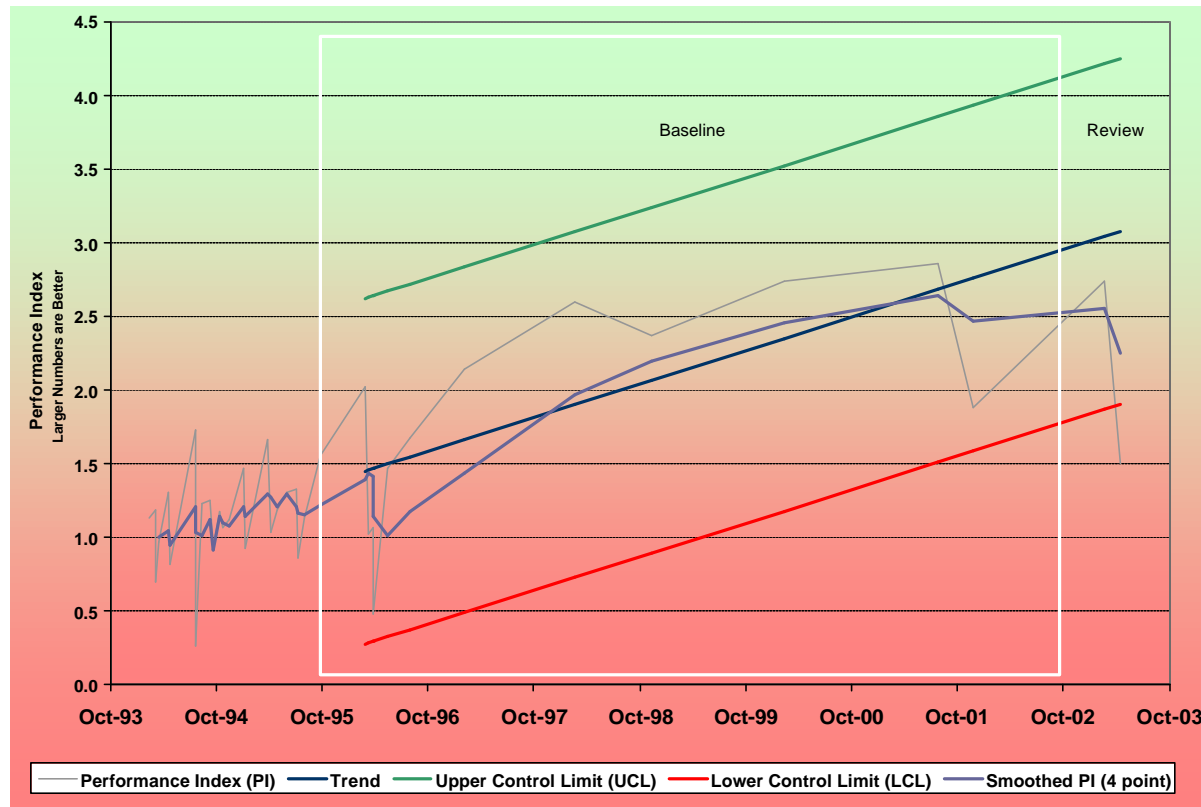
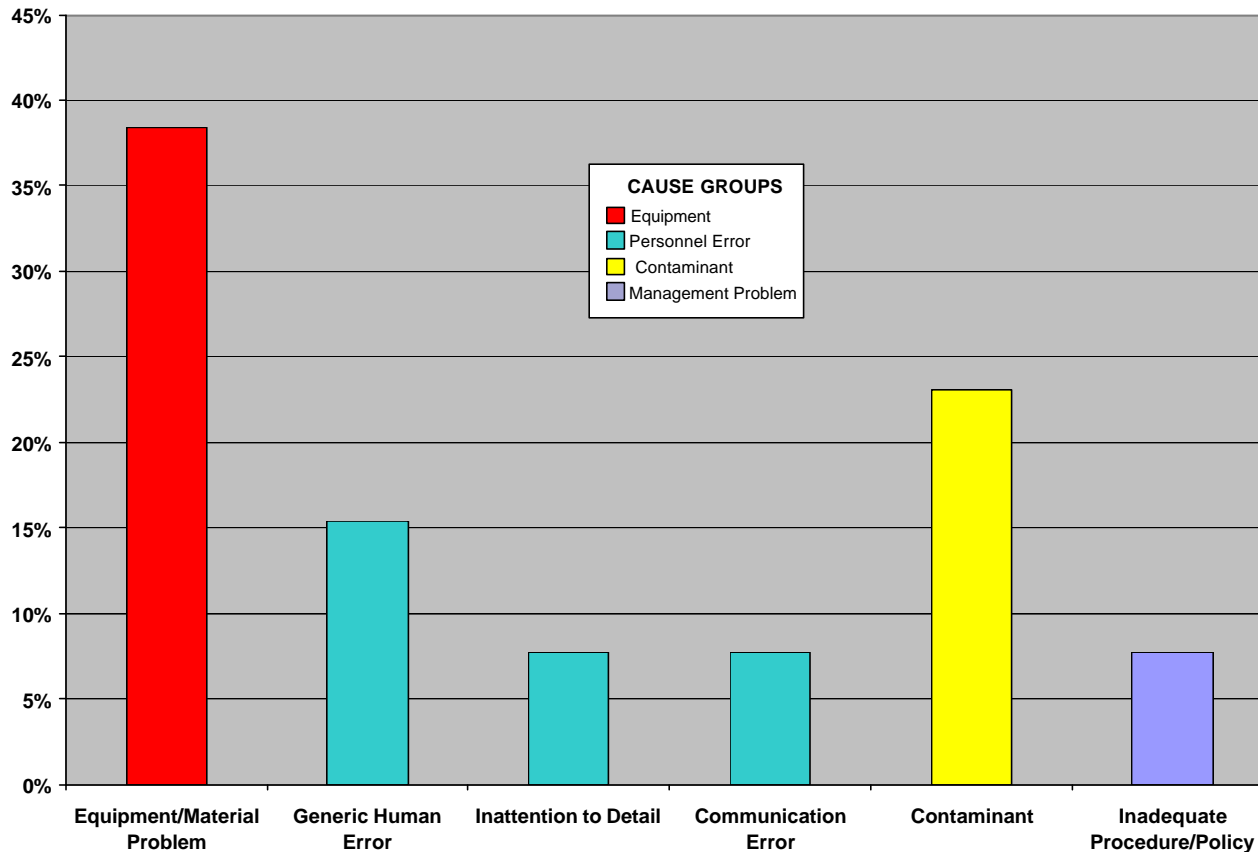**Sewage Release Control Chart**
(1/94 to 4/24/03)

39 total events severity weighted 2. No severity level 3 or 4 events.

- Pre-Baseline: 25 events
- Baseline: 12 events
- Review: 2 events

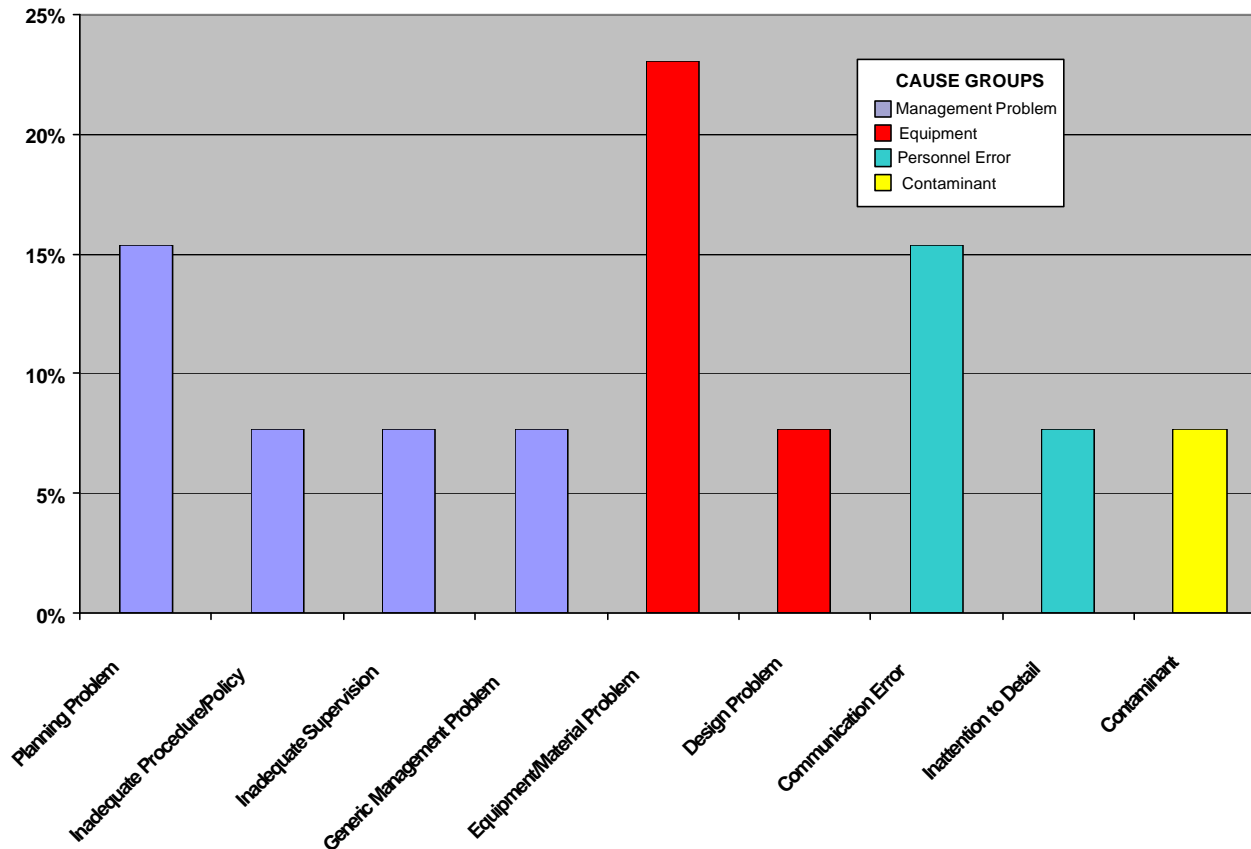| Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟥	**Annualized Rate**
🟥	**Control Limit**
🟨	**OVERALL SCORE**

Los Alamos

Direct Causes of LANL Sewage Release Occurrences

Direct Causes
Baseline and Review

• Equipment Problem identified as direct cause in 38% of sewage releases at LANL
• Personnel Error identified as direct cause in 31% of releases

CAUSE GROUPS
- Equipment
- Personnel Error
- Contaminant
- Management Problem

Equipment/Material Problem | Generic Human Error | Inattention to Detail | Communication Error | Contaminant | Inadequate Procedure/Policy

Los Alamos

Root Causes of LANL Sewage Release Occurrences

CAUSE GROUPS
- Management Problem
- Equipment
- Personnel Error
- Contaminant

X-axis categories: Planning Problem, Inadequate Procedure/Policy, Inadequate Supervision, Generic Management Problem, Equipment/Material Problem, Design Problem, Communication Error, Inattention to Detail, Contaminant

Root Causes
Baseline and Review

• Primary root causes for sewage releases are Management Problem and Equipment Problem—with 40% and 31% of total, respectively

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Profile of Corrective Actions for LANL Sewage Release Occurrences
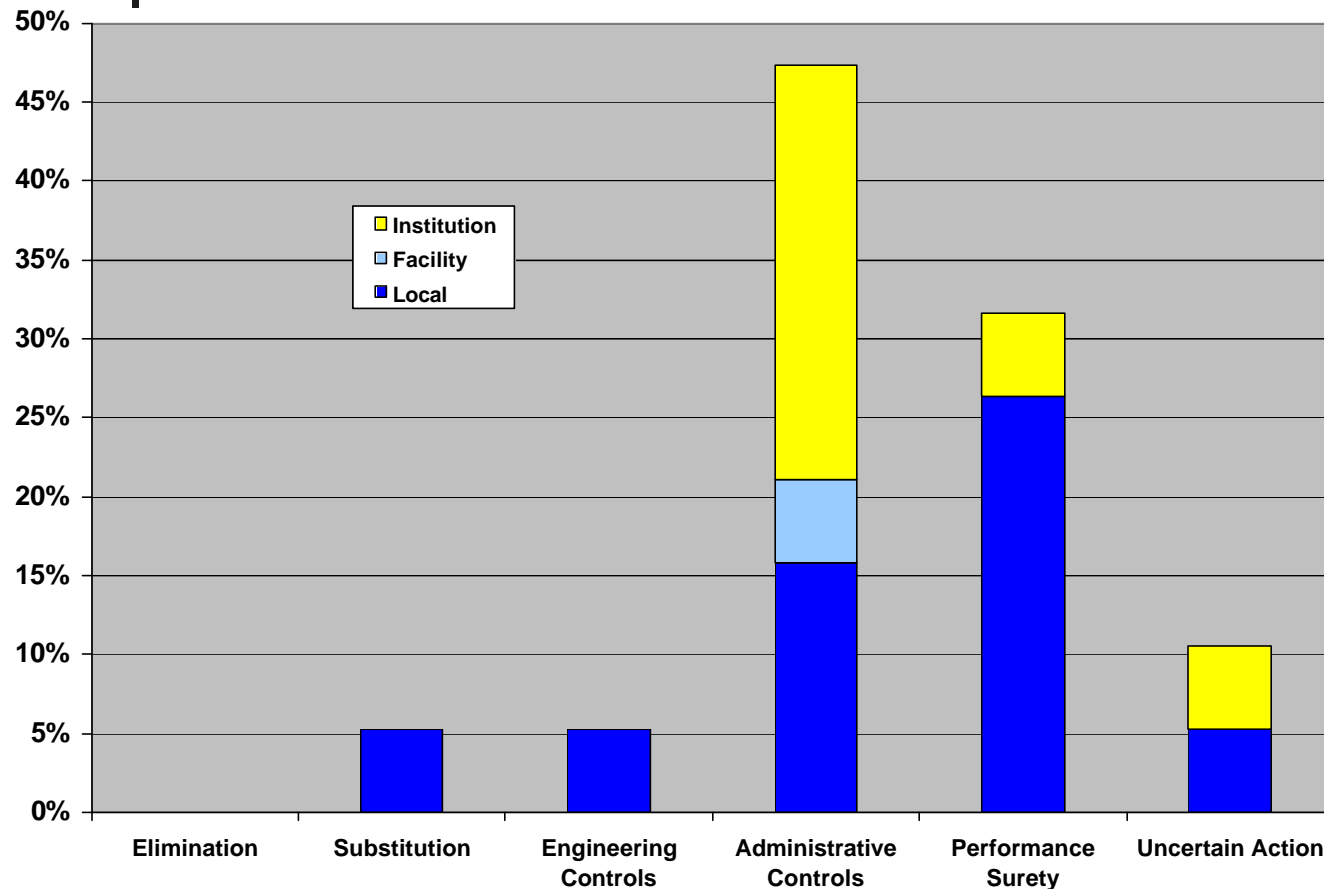
Corrective Actions
(10/99 to 4/24/03)

• Nearly 50% of actions involve new or modified procedures or policies
• About 32% of action involve "performance surety" type actions—primarily localized equipment repairs or area or equipment reviews
• About 37% of actions targeted at institutional level

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LANL Environmental Non-Compliance Occurrence Performance
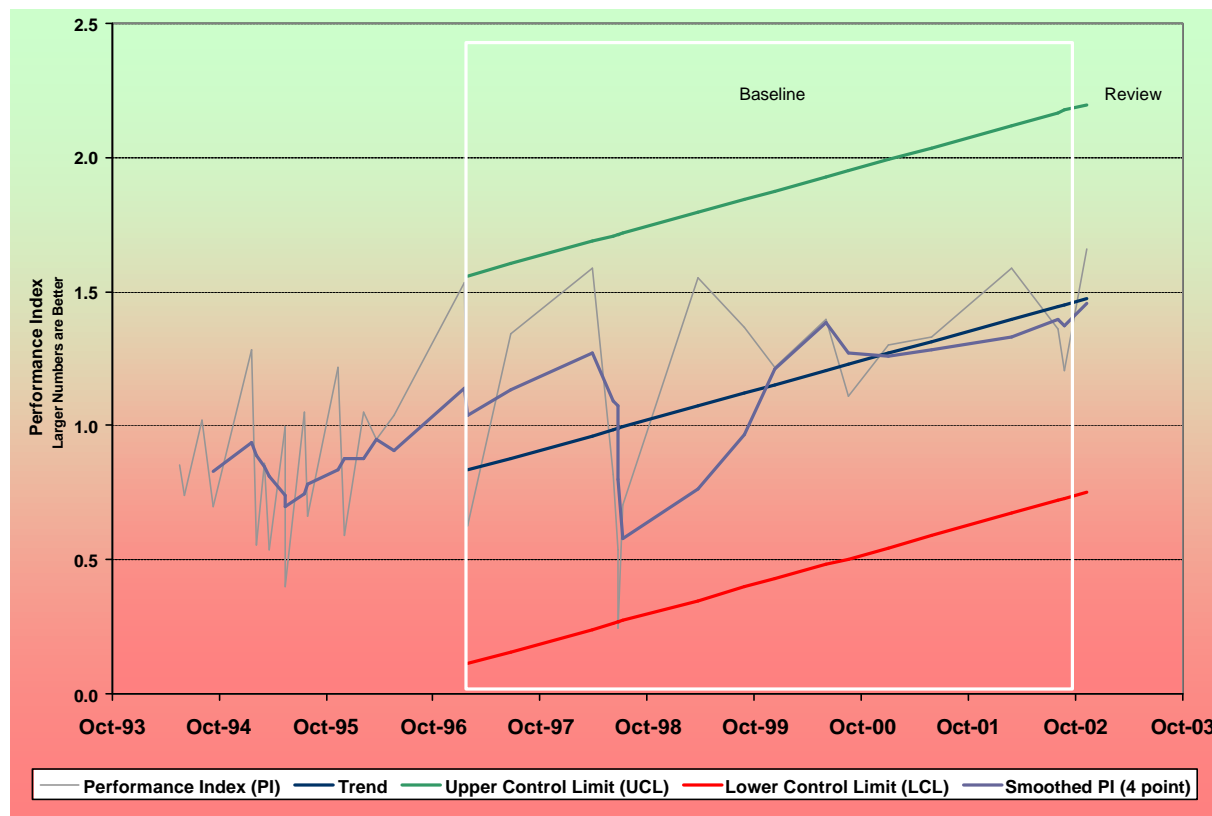
Environmental Non-Compliance Control Chart
(1/94 to 4/24/03)

- 37 total events severity weighted 2, 3, or 4.
  - Pre-Baseline: 19 events
  - Baseline: 17 events
  - Review: 1 event

Review Period Score	
🟩	Sustained Performance
N/A	Review Period Trend
N/A	Over/Under Trend
🟩	Annualized Rate
N/A	Control Limit
🟩	OVERALL SCORE

Los Alamos
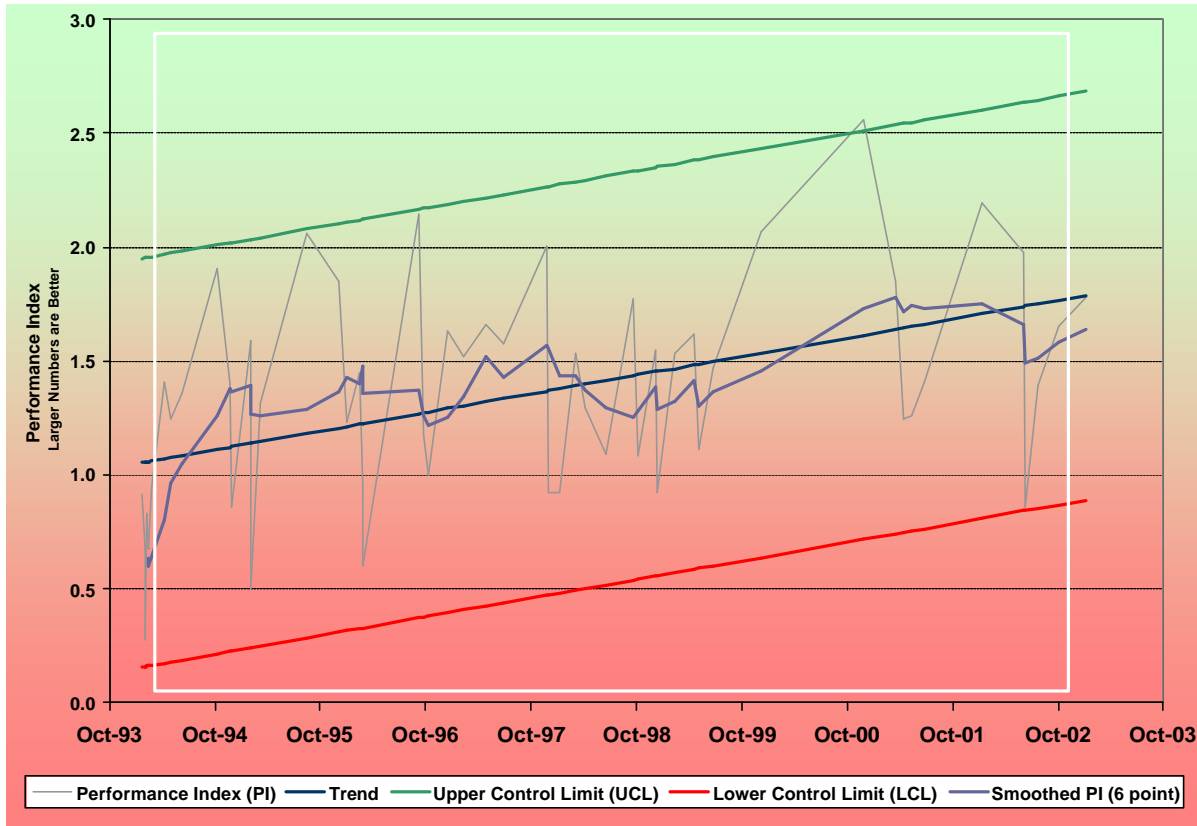
Fire Protection Occurrences

FY2003
(6 month)

Los Alamos

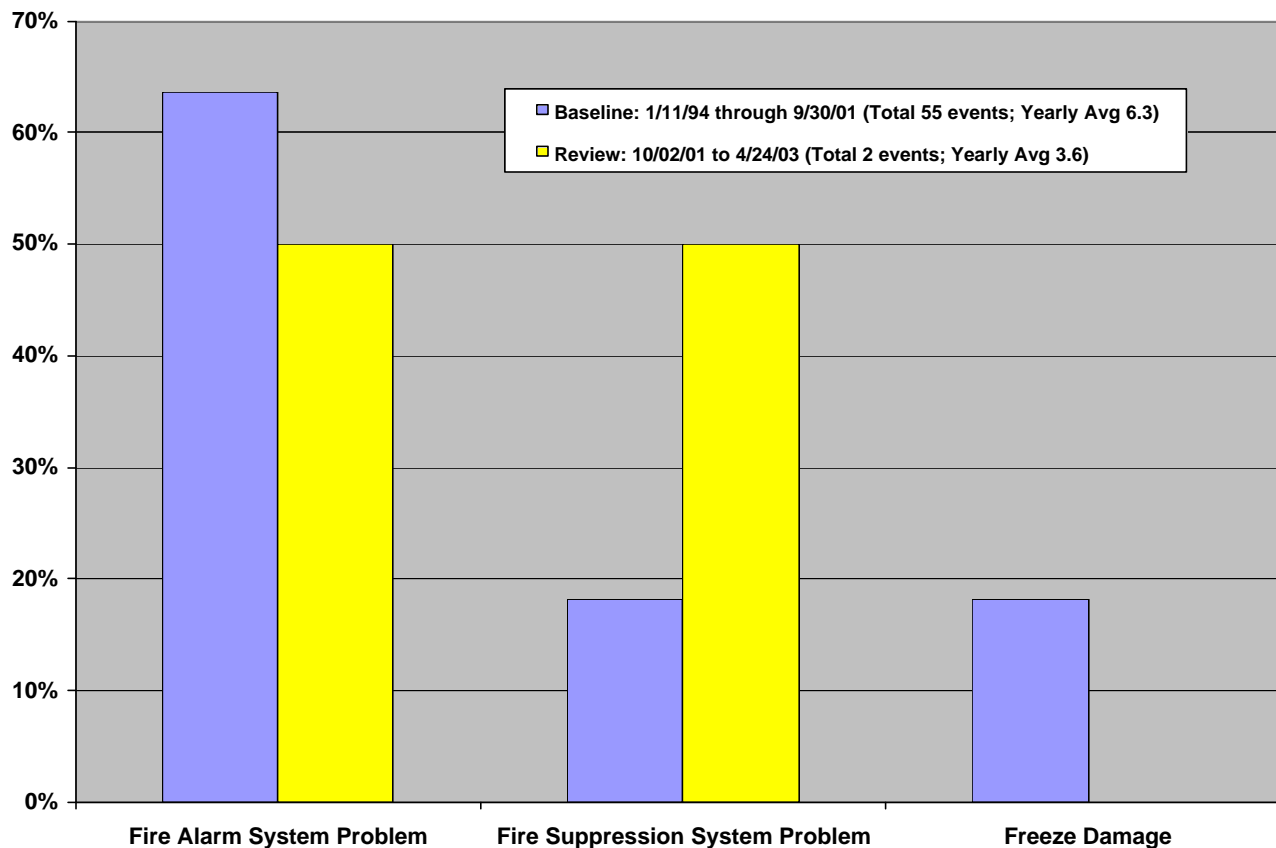# LANL Fire Protection Occurrence Performance

Fire Protection PI Control Chart
(1/94 to 4/24/03)

- 57 total events severity weighted 2, 3, or 4
  - Baseline: 55 events
  - Review: 2 events

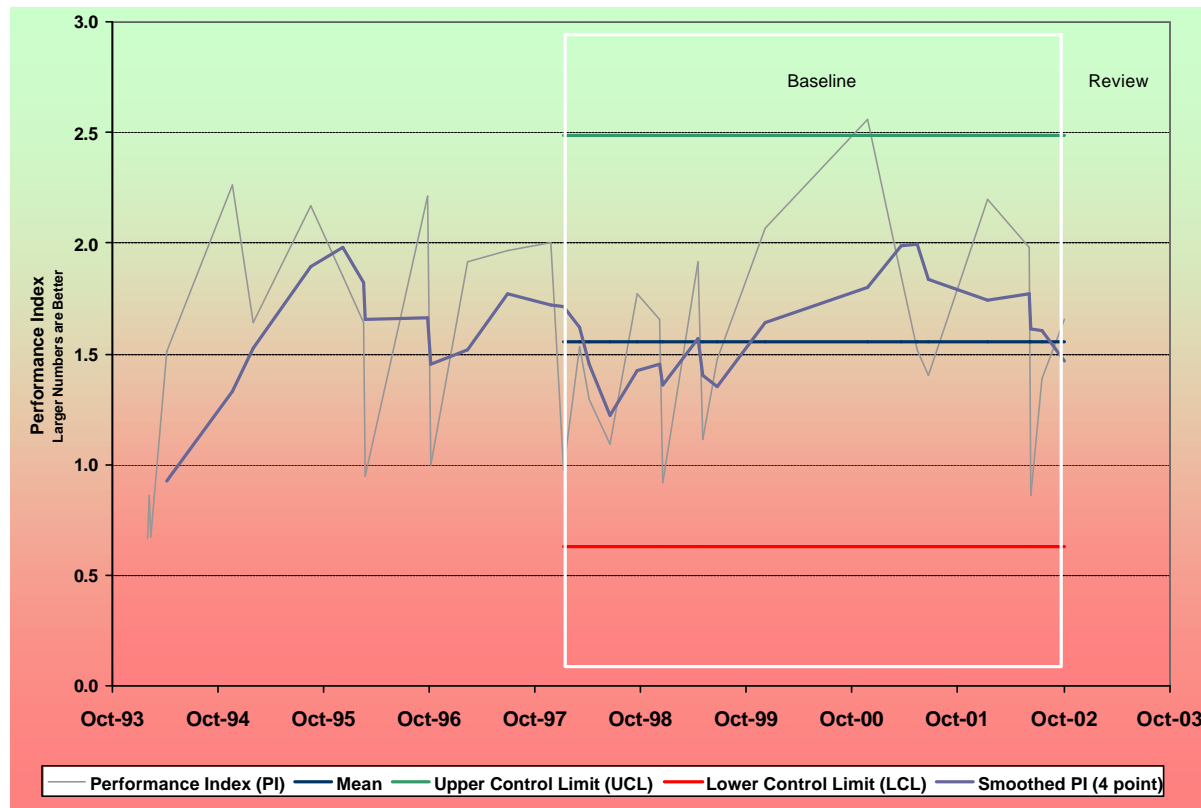| Review Period Score	
🟩	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**

Type Distribution of LANL Fire Protection Occurrences

Fire Protection Occurrences by Type
Baseline vs. Review

- Fire Alarm System Problem predominant type in baseline and review periods

- Fire Suppression System Problem increases from 18% to 50% in review (1 event)

Chart legend:
- Baseline: 1/11/94 through 9/30/01 (Total 55 events; Yearly Avg 6.3)
- Review: 10/02/01 to 4/24/03 (Total 2 events; Yearly Avg 3.6)

Categories: Fire Alarm System Problem, Fire Suppression System Problem, Freeze Damage

LANL Fire Alarm System Occurrence Performance

Fire Alarm System Control Chart
(1/94 to 4/24/03)

- 36 total events severity weighted 2, 3, or 4
  - Pre-Baseline: 16 events
  - Baseline: 19 events
  - Review: 1 event

Review Period Score	
🟨	**Sustained Performance**
N/A	**Review Period Trend**
N/A	**Over/Under Trend**
🟩	**Annualized Rate**
N/A	**Control Limit**
🟩	**OVERALL SCORE**